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GENERAL ELEMENTS

OF

Pathology.

> Εμοι δοκέει ἀρχὴ μεν ὂυν ὀυδεμία ἐιναι τοῦ σώματος, ἀλλα πάντα ὁμοίως ἀρχὴ, καὶ παν'τα τελευτή· κύκλου γαρ γραφέντος, ἀρχὴ οὐχ εὑρεθη. καὶ των νοσηματων ἐστι παντὸς ὁμοίως του σωματος.
>
> *Hippocrates de Locis &c. Cap.* I.

By WHITLOCK NICHOLL, M.D. M. R. I. A. F. L. S.
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The Vascular System consists, of the Heart; of the Arteries; of Exhalants; of Secreting vessels, with their several ducts, reservoirs, and outlets; of Sinuses and Veins; and of Absorbents.

All the several parts of the Vascular System are connected together. Arteries are, by their common trunks, connected with the Heart. The ultimate ramifications of Arteries form Exhalants, or Secreting vessels, or are continued into corresponding Veins. To Secreting vessels are appended, ducts, receptacles, outlets, Veins, and Absorbents. Veins are, by their large common trunks, connected with the Heart. The common trunks of Absorbents open into, and are connected with, large common trunks of Veins.

The Alimentary canal, consists of Fauces, Œsophagus, Stomach, and Intestines.

The Pulmonary air-cavities, consist of Larynx, Trachea, Bronchia, and Cells.

Blood of a bright florid scarlet colour flows from the left side of the Heart into the large Arterial trunk which is called Aorta. As some of the extreme branches of this Artery terminate in Exhalants, a part of the Blood which flows into it will pass by the open mouths of these vessels in the form of fluid, or of vapour. As some of the branches of the Aorta form Secreting vessels, a part of the Blood which is received by the Aorta will pass into those vessels. Of the Blood received by Secreting vessels, a part is separated in the form of a Secreted fluid, while the remaining part passes on by Veins, and is conveyed to the right side of the Heart. Of the Secreted fluid, a part may be taken up by Absorbing vessels, which will restore it to the mass of circulating Blood, while the remaining part either passes off directly by some duct or outlet, or flows into some reservoir, thence to be poured forth at some future time. As many of the extreme branches of the Aorta terminate in Veins, which, as I before stated, are connected with the right cavities of the Heart, it is evident, that a large share of the Blood received by the Aorta, passes in a direct stream from the left side of the Heart to the right side of that organ. The Blood, in passing from the extreme branches of the Aorta into corresponding Venous branches, loses its florid scarlet colour, and acquires a dark red hue.

To the right side of the Heart, is attached also the common trunk of the Pulmonary Arteries, some of whose extrême branches terminate in Exhalants, which open on the surface of the Bronchia, while the majority of those branches are continued on into corresponding branches of Pulmonary Veins, whose common trunks are attached to the left side of the Heart. The junction between minute extreme branches of the Pulmonary Arteries, and corresponding branches of Pulmonary Veins, takes place on the sides of the Pulmonary air-cells, into which Atmospheric air is admitted through the Trachea and the Bronchia. So that a part of the Blood which flows into the Pulmonary Artery passes by Exhalants, in the form of fluid, or of vapour; while the principal part of it flows on through the Pulmonary Veins to the left side of the Heart. The Blood, when it enters the Pulmonary Artery has a dark red hue, but, in passing from the extreme branches of this vessel, into corresponding branches of the Pulmonary Veins, it acquires, from exposure to the air contained in the Pulmonary air-cells, that florid scarlet colour which it had lost in passing from the extreme branches of the Aorta into the Aortic Veins, The process which the Blood thus undergoes, in its passage from the branches of the Pulmonary Artery into the Pulmonary Veins, may be called the *Pulmonic process*.

It appears, then, that Blood, when it quits either side of the Heart, must travel through two courses before it can arrive again at that side; for, before it can travel through the whole round of the circulation, it must pass through the Aortic circuit, and through the Pulmonic circuit.

It also appears, that the Blood, in performing the round of the circulation, has its mass diminished, by the separation of fluids in Secreting vessels, and by the passage of fluid, or of vapour, from the open mouths of Exhalants. This diminution may be called *the Waste*.

As the Blood is constantly suffering Waste, so is it continually receiving an addition of fluid from the Absorbing vessels. This addition may be called the *Supply*.

The Alimentary canal receives the greater part of the foreign matter from which the Supply is derived. The Teeth masticate the food, and thus they begin the first part of that process which is, ultimately, to render the nutriment fit for being received into those Absorbents which are termed *Lacteals*. The food, thus masticated, is mixed with Saliva, the flow of which is much promoted by those Muscular actions which move the lower jaw during the process of mastication. The masticated food, thus mixed with Saliva, passes into the Stomach, where it is mixed also with Gastric juice. The process termed Digestion then commences. The mass of food then passes into the Duodenum, where it is mixed with Bile, and with Pancreatic juice, and, in its further passage along the canal, it is also mixed with Enteric juice. The process termed Chylification then takes place, during which, a milky fluid is separated from the mingled mass; this fluid is called Chyle; it is received into the Lacteals, and, through these vessels, it flows into the common trunk of the Absorbents, and is, ultimately, poured into the common mass of the Blood. The passage of the Alimentary mass through the Intestines, is accomplished by a vermicular motion of the canal, which is called the peristaltic action of the Intestines. When the Chyle has been separated from the digested mass, the excrementitious residue is conveyed to the lower extremity of the canal, by means of the peristaltic action, aided by the contractions of powerful Muscles which are situated externally to that canal; and it is, ultimately, expelled from the canal by means of those actions.

The Aliment, then, is mixed with a part of the Waste; and the presence of this Waste, (which consists of Saliva, Gastric juice, Bile, Pancreatic juice, and Enteric juice) is necessary, in order that the processes of Digestion and of Chylification be performed. So that the production of the fresh Supply which enters the Lacteals, is dependent upon the presence of a part of the Waste.

There are other Absorbing vessels, besides the Lacteals, which take up fresh Supply, and convey it into the Blood; such are the Absorbing vessels which open upon the external surface of the Body, upon the surfaces of the air-passages, and, in short, upon all those passages which have external outlets. Absorbents also restore to the Blood a portion of the fluids which have been separated from it in Secreting vessels, or by Exhalants; thus, converting a part of the Waste, into a portion of the Supply. Absorbents also take up, and convey into the Blood, Matter which has formed a constituent part of the structure of the Body.

So that, although the office of all Absorbing vessels is so far the same, that they all take up, or receive, various kinds of Matter throughout the Body generally, yet may they be considered as performing three sets of offices. In the first place, they take possession of fresh Supply, which is, for the first time, entering the System; as when fresh Matter is absorbed from the internal surface of the Alimentary canal, or from the Pulmonary air-passages, or from other passages having external outlets, or from the surface of the Body. In the second place, they take possession of fluids which form a part of the Waste, as when Exhaled, or Secreted, fluids, pass into Absorbents. In the third place, Absorbents take possession of Matter which has previously been deposited from the Vascular System, and which has formed a portion of the structure of the Body; as when the more solid parts of the Body are removed by Absorbing vessels.

By performing the first of these offices, the Absorbents pour in fresh Supply; by the second, they restore a part of the Waste; by the third, they remove a part of the structure of the Body.

Let us then, for the sake of brevity, call the first of these offices, *Addition;* the second, *Restoration;* and the third, *Removal.*

The admission of Atmospheric air into the tubes and cells of the Lungs, and the expulsion of it from these, are regulated by what is termed Respiration, under which name are included two opposite actions, viz. Inspiration, and Expiration.

The mass of the Lungs consists principally of the air-tubes and cells, which admit of compression, and of subsequent expansion. The greater the quantity of air contained in these tubes and cells, the greater, of course, will be the volume of the Lungs; and the greater the degree in which the Lungs are compressed, the smaller will be the quantity of air contained in their tubes and cells.

The capacity of the cavities of the Thorax admits of increase, and of diminution; it is increased, if those ribs which are attached to the Sternum be drawn upwards, or if the Diaphragm descend; and it is diminished, if those ribs be drawn downwards, or if the Diaphragm be elevated.

The pressure of the Atmospheric air, acting through the Trachea, and the Bronchia, upon the internal surfaces of the Lungs, always adapts the volume of the Lungs to the capacity of the cavities which they occupy. So that, when this capacity is increased, air rushes into the tubes and cells of the Lungs, causing an expansion of these, and, thus, adapting the volume of the Lungs to the increased capacity of the Thorax. When the capacity of the Thorax is diminished, the Lungs being compressed, air is expelled from them through the Trachea, in consequence of which expulsion of air, the volume of the Lungs is diminished, in exact proportion to the diminution of the capacity of the cavities which they occupy.

The cavities of the Heart, during their state of dilatation, receive Blood from the Veins; the right cavities receive it from the Aortic Veins; and into the left cavities, it flows from the Pulmonary Veins; in the former cavities, the Blood is of a dark red hue; in the latter cavities, it has a florid scarlet colour. The Ventricles of the Heart, when they contract, force the Blood contained in them into their respective Arteries; the right Ventricle propels its Blood into the Pulmonary Artery; the left Ventricle forces its contents into the Aorta. The Blood, then, is endowed with a force by the contraction of the Ventricles of the Heart, which enables it to make its way into, and through, the Arteries, and their several terminations.

An Artery possesses a structure, which has a constant tendency to diminish the capacity of that vessel. This tendency is called its Tonicity. The Tonicity increases in proportion to the diminution of the size of the Artery.

An Artery also possesses a structure, which has a tendency to keep it pervious to a certain extent, but which resists any effort that may be made to dilate the vessel beyond that extent. This tendency is called its Elasticity.

When the Blood, then, endowed with force by the contraction of the Heart, endeavours to make a passage for itself through an Artery, it is opposed by the Tonicity of that vessel, but it is assisted, within certain limits, by the Elasticity; but, beyond those limits, it will be opposed by the Elasticity also.

The capacity of an Artery, then, is regulated by its own Tonicity and Elasticity, and by the force with which the Blood flows.

The force with which the Blood flows, depends upon the force, and the frequency, of the action of the Heart; upon the quantity of the general mass of that fluid; and upon the degree of resistance which is offered to its passage, into, through, and from, Arteries. This force is called the Momentum of the Blood.

The Nervous System consists of the Cranial Brain, of the Spinal Brain, of the Nerves, and of the Ganglia. All these several parts are connected together. The Cranial Brain is connected, by continuity of structure, with the Spinal Brain; Nerves are, by their Cerebral extremities, connected with the Cranial, or with the Spinal, Brain; and they are intimately connected, and interwoven, with each other. The Ganglia are formed, as it were, upon the Nerves.

Every part of the Nervous System is supplied with branches of the Vascular System; and every portion of the Vascular System, and of the parts appended to it, is supplied with Nerves. So that these two Systems are intimately connected, and, as it were, blended, together.

From the combined action of the Nervous, and of the Vascular, Systems, resulting from the influence exerted and received reciprocally by them, is produced that something which is called Nervous Power.

The generation of Heat in the living Body, is also, in a great measure, dependent upon the combined action of the Nervous, and of the Vascular, Systems.

The Nervous Power is conveyed by the Nerves. When it is conveyed to Secreting vessels, it influences and regulates the process of Secretion in those vessels. When it is transmitted to Muscles, it produces contraction of their fibres.

The Nervous System is the medium, by, and through, which, the Intellect holds communication with the rest of the Body, and with the other works of Creation.

Those states of the Nervous System, which give rise to the affections of the Intellect which are termed Sensations, I have termed Sensual states.* The predisposition in the Nervous System to assume those states, is called Sensibility.

Muscular fibres admit of contraction, and of relaxation. When they are not in action, they are, usually, in a state between contraction and relaxation, which intermediate state is called their Tone. Branches of the Vascular System, and of the Nervous System, are distributed throughout the fibres of Muscles.

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* See " A Sketch of the Œconomy of Man, 8vo. London, 1819.

Thus it appears, that the several parts of the Body are intimately connected with, and dependent upon, each other. For the functions of the Vascular System would cease, if those of the Nervous and Muscular Systems were suspended. The functions of the Nervous System would cease, if the offices of the Vascular System were suspended. And the Muscular System would be inert, were it not for the influence which it derives from the Vascular and from the Nervous Systems.

Quantity of the Blood.

If there be an increase of the mass of Blood, unaccompanied by an increase of the action of the Heart, either as to force, or as to frequency, the Blood, although its quantity is increased, will have its Momentum diminished.

In such a case, the Tonicity of Arteries being less strongly opposed, the capacity of those vessels, of the smaller Arteries especially, (in which, as, I have already stated, the degree of Tonicity is greater, in proportion to the size of the vessel, than it is in the larger Arteries,) will be lessened, so that an increased quantity of Blood, and an increased proportion of the general mass of that fluid, will be contained in the larger Arterial Trunks, in the Veins, and in the cavities of the Heart. The whole round of the circulation will be obstructed. A diminished quantity of Blood will pass into Secreting vessels, but Exhalation may be increased, owing to the lessened Momentum of the Blood. The action of the Heart will consist of slow, feeble, contractions, or of ineffectual flutterings. The Pulmonic process will be imperfectly performed, and Respiration will be laborious and hurried. The quality of the Blood will be rendered unnatural.

The circulation of Blood of an unnatural quality through the Cerebral blood-vessels, will induce disorder of the Cerebral structure, and of its functions. From the obstructed state of the whole round of the circulation, Congestion of Blood may take place in the Cerebral Veins and Sinuses, whence may ensue inordinate compression of the Cerebral substance, and, consequently, disorder of the whole of the Nervous System. Or, should the Cerebral Exhalants pour out an increased quantity of fluid, in consequence of the obstructed state of the Cerebral Veins, inordinate compression of the Brain may also be produced, unless the Exhaled fluid be removed in an equally increased proportion. The Sensibility of Nerves will be lessened, in consequence of the smaller quantity of Blood which circulates through the blood-vessels in their vicinity, as well as from the altered state of that Blood, and also in consequence of the disordered state of the Cerebral structure, with which their Cerebral extremities are connected. The production of Nervous power will be lessened, and the expenditure of it will be disturbed. The generation of Heat, and the capacity of the Body for Heat, may be lessened. Muscular action will be feebly, or imperfectly, or irregularly, performed. Sensation will be sparingly, or imperfectly, produced. The Depressing Passions will prevail. The Faculties will be feebly, or imperfectly, exerted. All these altered conditions of the several parts and functions of the œconomy, will produce disorder of the Alimentary canal, consequently, Digestion and Chylification will be imperfectly performed, and the Supply will be diminished and depraved. The performance of the Pulmonic process will become still more deranged, in consequence of the disordered state of the Nervous System, and of the Intellect, owing to the direct effects which such disordered states produce on the Respiratory Muscles. In short, Cause and Effect will act reciprocally throughout the whole œconomy, producing complete disorder of every part, and of every function.

If the mass of Blood be increased, and if the action of the Heart be also increased, so as to propel the greater mass with freedom, the Momentum of the Blood will also be increased.

In such a case, the Tonicity of the smaller Arteries being more powerfully opposed, these vessels will yield more readily to the current of the Blood, they will, therefore, receive a greater quantity of that fluid, and, consequently, an increased quantity must pass by their terminations. The quantity of Secreted, and of Exhaled, fluids, will be increased. The Blood will flow with greater force, and in greater quantity, throughout the whole round of the circulation. As an increased quantity of Blood will pass, in a given time, through the Pulmonic circuit, Respiration must be more quickly performed, otherwise that fluid will not duly undergo the Pulmonic process. The Sensibility of the Nervous System may be increased, and the functions of that System may be more freely performed. Nervous Power may be more freely produced. Heat may be generated in increased quantity. Muscular action may be performed with increased energy, and to a greater extent. The Depressing Passions will subside, and the livelier Passions will predominate. These altered conditions of the several parts and functions of the œconomy, will affect the state of the Alimentary canal; will alter the processes of Digestion and of Chylification, and will influence the action of that canal.

It may happen, that the increased quantity of Blood received by the Cerebral blood-vessels, may induce what I have termed *Erethism** of the Cerebral substance, or it may induce Inflammation of that substance. Or it may happen, either from simple Plethora of the Cerebral blood-vessels, or from Erethism of the Cerebral structures, (whether the state termed Inflammation be, or be not, present,) that an increased flow of fluid from the Cerebral Exhalants may take place, producing inordinate compression of the Cerebral substance. Or simple Plethora of the Cerebral blood-vessels may cause the Brain to be inordinately compressed. Such a state of the Cerebral structures, in what way soever induced, will cause disorder of the whole Nervous System.

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* See "Remarks on affections of the Cranial Brain in Infants." Transactions of the Association of the King's and Queen's College of Physicians in Ireland. Vol. iii.

If the quantity of Blood in the Vascular System generally, be lessened, the Heart, (having a smaller mass to propel, and, probably, receiving a slighter stimulus than before, and, probably also, having the Tone of its fibres diminished owing to the lessened quantity of Blood that flows through the Coronary vessels,) will act with less force, or with less frequency, or its actions may consist of feeble contractions quickly repeated. The Blood, then, will either flow in a languid manner, or it will be rapidly hurried through the round of the circulation. The Momentum of the Blood will be lessened, consequently, the smaller Arteries will more successfully oppose the entrance of that fluid into them. This increased resistance of the smaller Arteries, may still keep up, in the larger Arteries, a quantity of Blood nearly equal to that formerly contained in them. The quantity of Secreted fluids will be diminished, but, if the Blood flow in a feeble manner, the usual quantity, or even an increased quantity, of fluid, may pass from the open mouths of Exhalants.

If the Blood, although its quantity be much lessened, flow with increased rapidity, the velocity with which it is distributed, may, in some respects, compensate for its diminished quantity ; still, as the actual quantity of it is lessened, the quality of the fluids separated from it in Secreting vessels, will not be the same as before, even supposing that those fluids are secreted in the usual quantities.

As a smaller quantity of Blood, will, in the case now under consideration, flow through the blood-vessels of the Cranial and Spinal Brains, the functions of those structures may be, more, or less, suspended, or destroyed. The Nervous Power will be sparingly produced, and it may be irregularly distributed. The Sensibility of the Nervous System, generally, will be lessened. The temperature of the surface of the Body will be lessened. Sensation may be feebly, and scantily, produced. The livelier Passions may be wanting, and the Faculties may be feebly, and imperfectly, exerted.

It may happen, in consequence of the languid motion of the Blood, that an increased flow of fluid may take place from the Cerebral Exhalants, in which case, inordinate compression of the Cerebral substance may arise.

All these altered states of the Nervous System, of the Muscular System, and of the Intellect, will re-act upon the System of Supply and Waste, and upon the parts appended to it, increasing the disorder of these several parts.

The quantity of the general mass of the Blood, is dependent upon the quantity of Supply which that fluid receives from Absorbing vessels; and upon the extent of the Waste which it suffers, from the processes of Secretion and of Exhalation.

Action of the Heart.

IF the action of the Heart be more frequently repeated, the Blood will flow with increased rapidity throughout the whole range of the circulation, its Momentum will be increased, consequently, it will more readily gain admittance into the smaller Arteries. The Blood will flow more rapidly through Secreting vessels, so that a greater quantity of Secreted fluid may pass from those vessels, yet the process of Secretion may be less perfectly performed. Exhalation may be increased. The Blood, then, may have its quantity diminished, and its quality altered, by the separation of too great a proportion of its watery parts. As the Blood flows more hastily through the Pulmonic circuit, the Pulmonic process may be less accurately performed; but, as that fluid passes with increased velocity through the Aortic circuit also, it may not undergo the usual change in this latter circuit to the full extent, so that a less perfect, or less extensive, performance of the Pulmonic process, may suffice. Respiration will be more frequently performed. The increased rapidity with which the Blood flows through the Cerebral blood-vessels, may induce, in a greater, or less, degree, an Erethismal state of the Cerebral structures; consequently, the Sensibility of the whole of the Nervous System may be increased, and there may be an increased production of Nervous Power, and of Heat. If in consequence of the increased rapidity of the motion of the Blood, or in consequence of the production of an Erethismal state of the Cranial Brain, the Cerebral Exhalants pour out an increased quantity of fluid, inordinate compression of that Brain may ensue, If the Heart act with an increase of force only, the Momentum of the Blood will be increased, so that, as the Blood will flow more freely throughout the whole round of the circulation, there will not be any congestion of it in any part of the Vascular System. A greater quantity of Secreted fluids may be separated; and Exhalation may be increased. The functions of the Nervous System will be performed with greater energy. The temperature of the surface of the Body will be raised. Muscular action will be more vigorous. The Sensibility of the Nervous System will be increased. The livelier Passions will predominate, and the functions of the Intellect may be performed with increased energy.

An increase both of the force, and of the frequency, of the action of the Heart, will produce, in a greater degree, or more rapidly, the effects which result from increased frequency of that action.

I have already traced the general effects which result from diminished action of the Heart, when coupled wtth an increase of the mass of Blood. Similar effects, in a less degree probably, will proceed from a diminution of the force, or of the frequency, of the Heart's action, when the quantity of the Blood does not exceed the natural standard.

The causes of increased action of the Heart, may be: an altered state of its Muscular texture; increased Sensibility of its Nerves; the transmission of an increased quantity of Nervous Power by those Nerves; an altered quality of the Blood; an increased quantity of that fluid; a more hurried performance of the act of Respiration; and Bodily exercise.

The action of the Heart may be increased, owing to an increase of its Muscular texture, or to an increase of Tone, in the fibres of that texture.

The tone of the Muscular Fibres of the Heart may be increased, owing to an increase, (within certain limits) of the quantity of Blood that flows through the Coronary vessels; or, owing to the increased exertion, (within certain limits) of those fibres.

The Sensibility of the Nerves of the Heart, may be increased, in consequence of a general increase of the Sensibility of the Nervous System; or by the application of *Stimulants* to any part of that System; or by an increase of the Temperature of the Body; or by an increase (within certain limits) of the quantity of Blood that flows through the Coronary vessels; or by altered states of that Blood; or by powerful Sensations; and by certain Passions, as Joy, Pride, and Anger.

An increased quantity of Nervous Power may be conveyed to the Heart, owing to the Nerves of that organ becoming more ready conductors of that power; or owing to powerful affections of the Intellect; or from certain impressions on the Cranial Brain.

The altered quality of the Blood which may give rise to increased action of the Heart, may arise from the more extensive performance of the Pulmonic process; from the respiration of certain gases; from increased Restoration of Secreted fluids by Absorbing vessels; from diminished Secretion of certain fluids; or from the introduction of certain Stimulating substances into the Blood.

The action of the Heart may be lessened, owing to diminution of the Tone of its Muscular fibres, which may arise from a previous high degree of exertion of those fibres; or from the long continuance of a high degree of opposition to that action, whether such opposition arose from an increase of the mass of Blood, or from an impediment existing in any part of the round of the circulation. Or the Tone may be diminished, in consequence of a distended, or Aneurismal, state of those fibres, produced by any of the preceding causes; or it may arise from a lessened quantity of the Blood distributed through the Coronary vessel; or, perhaps, from an altered state of that Blood.

A diminished action of the Heart may arise, from induration of its texture; from the conversion of its substance into a fatty, or a cartilaginous, or an osseous, substance; from its becoming gangrenous; or from rupture of some of its fibres.

The action of the Heart may be lessened, in consequence of a diminution of the Sensibility of its Nerves. This may arise from the influence of certain Poisons, or Sedatives, acting through the medium of other Nerves, or through the Cranial Brain, or, directly, upon the Nerves of the Heart; whether such poisons be applied to the surface of the Body, or of the air-passages, or of the Alimentary canal, or of other passages having external outlets, or whether they be injected into the blood-vessels. The Sensibility of the Nerves of the Heart may also be lessened, in consequence of a reduction of the Temperature of the Body, or from a diminution of the quantity of Blood that flows through the Coronary vessels; or from an altered state of that fluid, or from diminished Sensibility of the Cranial Brain. Violent degrees of Sensation, (extreme pain for instance,) may lessen the action of the Heart, and they, probably, produce this effect, by lessening the Sensibility of the Cranial Brain.

A lessened quantity of Nervous Power may be sent to the Heart, owing to a scarcity of that Power, whether arising from increased expenditure, or from diminished production of it; or in consequence of the Nerves of the Heart being rendered less fit conductors of that Power.

It is possible, that the action of either Ventricle may be lessened, owing to an altered state of the Blood which it contains. Thus, if florid Blood be received by the right Ventricle, or dark Blood by the left Ventricle, the action of each of those cavities may be lessened.

The free *diastole* of the Heart, may be opposed, by a diminution of the capacity of the cavity which that organ occupies, this may be caused by deformity of the Thorax; by collections of fluid in the cavities of the Pleuræ, or in the Pericardium; by distension of the Stomach; by irregular action of the Diaphragm; by the act of Retching; in short, by any mechanical opposition to the enlargement of the cavities of the Heart.

An impediment existing in any part of the round of the circulation, whether in the Pulmonic, or in the Aortic, circuit, may lessen, or suspend, the action of the Heart.

Tonicity of Arteries.

If the Tonicity of the smaller Arteries be increased, those vessels will more powerfully oppose the Momentum of the Blood, consequently, an increased degree of resistance will be offered to the action of the Heart. A smaller quantity of Blood will enter the smaller Arteries, consequently, there will be a smaller quantity of Secreted, and of Exhaled, fluids; a larger quantity of Blood will be contained in the larger Arteries, in the Veins, and in the cavities of the Heart. The whole round of the circulation will be obstructed. In short, those effects will, in a greater, or less, degree, be present, which have already been enumerated as proceeding from an increase of the mass of Blood, when unaccompanied by increased action of the Heart.

If the Tonicity of the smaller Arteries be lessened, the Momentum of the Blood will be less powerfully opposed, consequently, an increased quantity of that fluid will enter those vessels. The distribution of the Blood will be more easily effected by the action of the Heart, and a less degree of that action will suffice. Secretion and Exhalation will be increased. In short, effects may arise, the reverse of those which are produced by increased action of the Tonicity of the smaller Arteries.

But should the Tonicity of the Cerebral Arteries be so far lessened, that those vessels become over-distended with Blood: or if, in consequence of the receipt of an increased quantity of Blood by those vessels, an increased flow should take place from the Cerebral Exhalants; in either of these cases, inordinate compression of the Cerebral substance may arise.

The Tonicity of Arteries may be more strongly exerted, in consequence of a diminution of the Momentum of the Blood; or from a reduction of Temperature; or from the application of *Astringents;* or from diminished Sensibility of the neighbouring Nerves; or from the influence of Passions.

A diminution of Temperature increases the action of the Tonic power of Arteries, by its direct effect upon those vessels; and, indirectly, by lessening the action of the Heart, and the Sensibility of the Nervous System.

The Passions which induce increased action of the Tonic power of Arteries, are, chiefly, Terror, and Disgust.

The Tonicity of Arteries may be lessened, by causes the reverse of those which produce an increase of it; or by an altered condition of those vessels, as by rupture, or ulceration, or wounds of their coats, by Aneurism, by Ossification, &c. Rage, Shame, and Joy, lessen the action of the Tonic power of the Arteries of the Face and Neck, by their direct effects upon these vessels, If the Tonic power of one set of Arteries be less strongly exerted, as the Blood will more readily flow into such vessels, a smaller quantity than usual will flow into other Arteries; consequently, the Tonicity of these latter vessels will be more powerfully exerted than before.

Secretion.

IF the process of Secretion be generally increased, there will be, either a proportionate diminution of Exhalation, or an increase of Waste.

If an increased quantity of fluid be separated from the Blood in one particular set of Secreting vessels, a smaller quantity will be separated in other Secreting vessels; or Exhalation will be lessened; or both these effects will ensue; otherwise the Waste will be increased.

The particular effects which result from an increased Secretion of any particular fluid, depend upon the peculiar character and properties of that fluid, and upon the purposes which it is destined to fulfil in the œconomy. Thus, if the Salivary, or the Gastric, fluids, be secreted in increased quantity, there will be, in addition to the other effects which may arise, a disordered state of the Alimentary canal, whence may ensue, Vomiting, or an increase of the natural action of the Intestines; and an imperfect performance of the processes of Digestion and of Chylification; the quantity, and the quality, of the Supply will, consequently, be altered from the natural state. Similar effects may result from an increased secretion of the Pancreatic, and of the Enteric, fluids. If Bile be secreted in an increased quantity, the state of the Alimentary canal will be altered; the natural action of that passage may be increased, or Vomiting may take place. Or, should such increased quantity of Bile not find a ready passage into the canal, the Biliary ducts will become obstructed, in which case, the flow of Blood through the Portal System will be obstructed; or an increased quantity of Bile may pass into Absorbing vessels, in which case, the quality of the Blood will be altered, the appearance termed Jaundice may arise, and general languor, with torpor of the Intellectual functions, may be present.

If the process of Secretion be generally lessened, there will be, either a proportionate increase of Exhalation, or a diminution of Waste. In either case, the quality of the Blood will be altered.

The diminished Secretion of any particular fluid, may cause an increased quantity of fluid to be separated in other Secreting structures; or it may induce an increase of Exhalation otherwise, the Waste will be lessened.

If there be a diminished Secretion of those fluids which flow into the Alimentary canal, the processes which ought to be carried on in that passage will be imperfectly performed, and, consequently, the Supply will be diminished, or depraved. The natural action of the canal will be lessened. Similar effects will result from diminished secretion of Bile, in addition to which, there will be general languor, together with torpor of the Intellectual functions,

If there be a diminished Secretion of Urine, there will be, in addition to the other consequences of lessened Secretion, such an unnatural condition of the Blood, as may, from the circulation of that Blood through the Cerebral Blood-vessels, induce, possibly, an Erethismal state of the Cerebral substance.

An increase of the process of Secretion, may arise from a greater quantity of Blood being received by Secreting vessels; or from an altered state of that fluid; or from an increased quantity of Nervous Power being received by Secreting vessels; or from the influence of Passions.

An increased quantity of Blood may enter Secreting vessels, owing to an increase of the general mass of that fluid; or from increased action of the Heart; or from diminished Tonicity of those Arteries to which Secreting vessels are appended; or in consequence of a lessened flow of Blood by the other terminations of those Arteries, whether by Veins, or by Exhalants; or owing to other Arteries receiving less than their usual proportion of the general mass of the Blood. A more ready, or more frequent, evacuation of Secreted fluids, from the vessels, or from the receptacles, in which they are contained, may also cause those fluids to be secreted in an increased quantity.

The presence of an increased proportion of watery parts in the Blood, may cause an increased quantity of fluid to be separated in Secreting vessels. The introduction of various substances into the Blood, will increase the process of Secretion, either generally, or in particular vessels. Thus, the presence of preparations of Mercury in the Blood, leads to a general increase of Secretion; it also affects, in a particular manner, the Secretion of Bile. Medicines which belong to the class *Diuretics*, will, if introduced into the Blood, increase the Secretion by the Kidnies.

An increased quantity of Nervous Power may be conveyed to Secreting vessels, owing to an increased production of that Power, or owing to the Nerves, which belong to those vessels, being rendered more fit conductors of it. Thus, an increased quantity of this Power may be conveyed to Secreting vessels, owing to a general increase of the Sensibility of the Nervous System; or to an increase of Sensibility in the Nerves of those vessels, whether such increase arise from the application of Stimulants, or from friction, or from increased temperature.

Certain Passions influence the process of Secretion in particular vessels. Thus, Grief, Rage, Shame, or Joy, may cause an increased production of Lachrymal fluid. Grief, Shame, or Fear, may increase the Secretion of Urine. Anger may increase the Secretion of Bile. Parental fondness increases the Secretion of Milk. Grief, Fear, Surprise, or Desire, may increase the Secretion of the Catamenia.

Secretion may be diminished, by causes the reverse of those which produce an increase of it. It may also be lessened in consequence of an obstructed state of the Secreting vessels.

Secreting vessels may become obstructed, from any cause acting mechanically upon them so as to produce a diminution of their capacity. Thus, the deposition of Lymph, or the accumulation of any fluid in the interstitial membrane which connects these vessels; the presence of Tumours, of Hydatids, of Abcesses, or of foreign substances, in the immediate vicinity of these vessels; will cause a diminution of Secretion in them, by lessening their capacity, as well as by pressing on the Nerves which belong to them, and, thus, rendering those Nerves less perfect conductors of the Nervous Power. Secreting vessels may also become obstructed, in consequence of an impediment existing, either, to the passage of the Secreted fluid by its proper ducts, and outlets; or to the flow of Blood from them by the Veins which are appended to them?

May not Secreting vessels become obstructed in consequence of an altered quality of the Blood, arising from a deficiency of its watery parts; the Blood, in such a case, not being sufficiently diluted to pass with freedom through those vessels?

The process of Secretion may be less accurately, and less extensively, performed, in all those Secreting vessels which receive florid Blood, owing to an imperfect performance of the Pulmonic process.

The application of Sedatives to the Nerves belonging to Secreting vessels, or the division of those Nerves, between their Cerebral and their anti-cerebral extremities, will cause a diminution of Secretion in those vessels.

Pride may restrain the Secretion of Tears, Grief may diminish the production of Bile. Dislike towards a child may lessen the Secretion of Milk.

Exhalation.

IF Exhalation be generally increased, there will be, either a proportionate diminution of the fluid which is separated in Secreting vessels, or an increase of Waste.

When those Exhalants, which open into cavities, pour out an increased quantity of fluid, if the Absorption of that fluid be not increased in the same proportion, an accumulation of that fluid will take place, constituting what is termed Dropsy. In this manner, Exhaled fluid may be accumulated within the Cranium, whether in the Ventricles of the Cranial Brain, or between its investing membranes; or in the cellular substance of the Lungs, or in the cavities of the Pleuræ, in the Anterior Mediastinum, in the Pericardium, in the cavity of the Peritoneum, in the Ovaria, in the Tunica Vaginalis, or in the Cellular substance investing the Body generally. It may also be accumulated in the Pulmonary air-passages.

The effects which result from such accumulations of exhaled fluid, depend upon the situations in which they occur.

If such an accumulation take place within the Cranium, the Cranial Brain will be subjected to an inordinate degree of pressure, and, consequently, the state of the whole of the Nervous System will become disordered.

If it take place in the Cellular substance of the Lungs, the due dilatation of the Pulmonary air-cells will be prevented, consequently, the performance of the Pulmonic process will be, more, or less, imperfect.

If the Exhaled fluid be collected in the cavities of the Pleuræ, or in the Pericardium, the due dilatation of the Lungs will be impeded, and the due *diastole* of the Heart will be prevented; so that the Pulmonic process will be imperfectly performed, the action of the Heart will be altered, and the whole round of the circulation will be, more, or less, obstructed.

If the fluid be collected within the Abdominal cavity, the capacity of the Thorax may be diminished, and the enlargement of it will be prevented by the opposition made by the fluid to the descent of the Diaphragm. The Pulmonic process will, therefore, be imperfectly performed. The accumulation of the fluid in this situation, will also cause the contents of the

Abdominal cavity to be subjected to an increased degree of compression. The functions and action of the Alimentary canal may be disordered, consequently, the quantity of Supply may be lessened, and its quality may be altered. The current of the Blood may be obstructed, and the due Secretion of Bile may be prevented both from this effect, and from the increased pressure which is made upon the substance of the Liver.

If fluid be accumulated in the Cellular membrane which invests the Body generally, the action of Muscles will be, more, or less, obstructed, the temperature of the surface of the Body will be lessened, and the flow of Blood through the superficial blood-vessels will be impeded.

If fluid be collected in the Pulmonary air-passages, the due admission of Atmospheric air into these cavities will be prevented, and those Muscular actions may be called forth, which constitute Coughing.

If Exhalation be diminished, there will be, either a proportionate increase of the quantity of Secreted fluids, or a diminution of Waste; in which latter case, the quantity of the circulating fluid will be increased, and its quality will be altered, by the presence of too large a proportion of watery parts in that fluid.

Exhalation may be increased, in consequence of an increased quantity of Blood being received, in a given time, by Arteries, whether such increased receipt of Blood arise from an increase of the general mass of that fluid, or from increased action of the Heart, or from diminished action of the Tonic power of the Arteries.

An increased quantity of fluid may pass by Exhalants, owing to diminished Momentum of the Blood, or in consequence of an altered state of the Blood, or from less than the usual quantity passing by Veins, or through Secreting vessels, or from an obstructed state of any part of the round of the circulation.

The application of *Stimulants* to any part of the Body, is, in many instances, followed by an increased flow from the Exhalants of that part. Thus, the application of Cantharides, or of a heated substance, violent friction, and the like, are followed by an increase of Exhalation. And, although Stimulants be not applied, yet, if the

Sensibility of Nerves be so much increased, that impressions, which, in the former state of those Nerves, produced scarcely any effect, act as Stimulants usually do, such impressions may, during the continuance of this high state of Sensibility, cause an increase of Exhalation.

As an irritated state of the anti-cerebral extrèmities of Nerves, leads to an increased flow from the Exhalants in their vicinity, so does an irritated state of the Cranial Brain, lead, in many instances, to increased effusion from the Cerebral Exhalants.

An increase of Temperature may increase Exhalation, either by increasing the action of the Heart; or by lessening the Tonicity of Arteries; or by acting as a Stimulant on the Nervous System; or, perhaps, by its direct action on the Exhalants themselves.

A high degree of Muscular action, or a long continuance of that action, may cause a general increase of Exhalation. The Muscular actions may induce this effect, by quickening the action of the Heart, or by increasing the Temperature, or by obstructing the flow of Blood through the blood-vessels which are intermingled with the Muscular fibres; or by increasing the Sensibility of the Nervous System; or by causing an interruption of the process of Respiration, in consequence of which, the whole round of the circulation becomes obstructed.

A high degree of Pain, increases, in many instances, the flow by Exhalants.

Shame, Fear, Dislike, Surprize, may, each, produce an increase of Exhalation. They may effect this, by increasing the action of the Heart; or by causing a suspension of Respiration, in which case, the whole round of the circulation will be obstructed; or by lessening the action of the Heart, and thus causing the Momentum of the Blood to be lessened; or by their direct effects upon the Nervous System.

A torpid state of the Cranial Brain, tends to produce an increase of Exhalation. Thus, in that state of the Cranial Brain which constitutes Sleep, there is an increased tendency to perspiration by the Exhalants of the surface of the Body.

Exhalation may be lessened, in consequence of a smaller quantity of Blood being received by the smaller Arteries, owing to an increased exertion of their Tonic power; or from an increased flow by Secreting vessels, or by Veins; or, perhaps, from a deficiency of watery parts in the Blood.

The Exhalants may be so altered as not to allow the usual quantity of fluid to pass through them. Such alteration may occur, during a great increase of the Sensibility of the Nervous System; or in consequence of a diminution of temperature. It may also occur, when the evolution of Heat from the surface of the Body is much increased, as is seen in Febrile states.

Veins.

If an increased quantity of Blood pass by Veins, a smaller quantity will pass by other terminations of Arteries, whether by Secreting vessels, or by Exhalants, or by both these; consequently, the Waste will be lessened.

If a smaller quantity of Blood pass by Veins, an increased quantity will pass by Secreting vessels, or by Exhalants, or by both these sets of vessels; in either of which cases, the Waste will be increased; or an impediment will exist to the passage of Blood from the corresponding Arterial branches, in which case, the general current of the Blood will be obstructed.

An increased quantity of Blood may pass through Veins, owing to a greater quantity of Blood being received by Arteries; or owing to a lessened quantity passing by Secreting vessels, or by Exhalants; or in consequence of an increased capacity of the Veins.

The capacity of Veins may be increased, in consequence of an increase of temperature.

A diminished quantity of Blood may pass by Veins, owing to a smaller quantity being received by Arteries; or owing to an increased quantity passing by the other terminations of Arteries; or owing to an obstructed state of the Veins.

An obstructed state of the Veins may arise, from an altered condition of those vessels, as from a Varicose state of them, or from an obstruction existing in any part of the round of the circulation.

Absorbents.[*]

WE now come to the consideration of the process of Absorption.

If the process of Addition be diminished, while the Waste continues to the usual extent, there will be a gradual diminution of the quantity of the Blood, and an alteration of the quality of that fluid. If, then, Restoration and Removal be performed to the usual extent only, a diminution of Addition will give rise to gradual emaciation of the Body.

If Restoration be diminished, while Addition is carried on as before, the Waste will be increased, and the quality of the Blood will be altered. There will be an increased excretion of Secreted fluids. The principal effect will be, an accumulation of Exhaled fluids, constituting Dropsical collections. An accumulation may also take place of those Secreted fluids which are poured into cavities, from which there is no outlet, or from which the outlet is indirect, or is subject to impediment. Thus, accumulations of fluids may take place in the Alimentary canal, disturbing the processes of Digestion and of Chylification, and causing an altered state of the action of that canal. In short, from diminished Restoration, effects will arise, similar to those which result from an increase of the processes of Secretion and of Exhalation.

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[*] See "Aphorisms respecting Absorption" in the Appendix.

If a diminution of Addition be accompanied by an increase of Restoration, the quantity of the Blood may still be kept up to its natural standard; yet its quality will be much altered.

If a diminution of Restoration be accompanied by a corresponding increase of Addition, the surplus of Supply will balance the increase of Waste. But, in such a case, the quality of the Blood may be altered, although its quantity be kept up to the usual standard.

If Addition, Restoration, and Removal, be all lessened, the diminution of the latter will prevent much emaciation, but all those effects will be present, which result from the diminution of the two former processes.

If Removal only be lessened, while the usual depositions of fresh Matter are made, those parts, in which such diminution occurs, will be preternaturally enlarged.

A diminution of Absorption generally, does not, then, necessarily imply the production of emaciation; nor does the diminished performance of one of these three processes, necessarily imply a diminution of the quantity of circulating Blood. But, whether the performance of one process, or of all the processes, be diminished, an alteration of the quality of the Blood may ensue.

If Addition be increased, (and if Aliment be furnished in increased quantity, and the processes of Digestion, and of Chylification, be properly performed,) the quantity of the Blood will be increased, the growth of the Body will be promoted, and all the other effects of increase of the mass of Blood may be present.

If Restoration be increased, all the surfaces upon which Secreted or Exhaled fluids are poured out, will be, more, or less, dry; there will be a diminished excretion of Secreted fluids, and the processes which are dependent upon the presence of those fluids will be less perfectly performed. In short, effects will be present, simimilar to those which arise from diminished performance of the processes of Secretion and Exhalation.

If Removal be increased, and if the deposition of fresh Matter be not proportionably increased, emaciation will rapidly be produced, the quantity of the Blood may be increased, and the quality of it may be altered.

If Addition, Restoration, and Removal, be all increased, the quantity of the Blood will be much increased, and its quality will be much altered. But, as the increase of Removal will balance any increased deposition of fresh Matter, which may result from the increase of the two former proceses, there will, (if that balance be evenly adjusted) neither be growth of the Body, nor emaciation.

Thus, as the Waste consists of the fluids which are separated from the Blood by Secreting, and by Exhaling, vessels, it is counter-balanced by the three effects of Absorption, namely, by Addition, by Restoration, and by Removal. Yet, on the other hand, as the process of Removal counter-balances the deposition of Matter from the blood-vessels, so may it be considered, as far as regards the growth of the Body, as opposed to the process of Addition.

The quantity of Matter that passes into Absorbing vessels, depends upon the quantity submitted to them; and, also, upon the action of the Absorbing vessels themselves.

The quantity of Matter which is submitted to those Absorbents which perform the office of Addition, depends, as far as regards the Lacteals, upon the extent to which the process of Chylification is performed, upon the degree of celerity with which the Aliment passes through the Intestines, and upon the thickness of the coating of Mucus which is interposed between the Aliment and the open mouths of the Lacteals. The quantity of Matter submitted to the other Absorbing vessels which also perform the office of Addition, depends upon circumstances, which may, in a great degree, be regulated by the will of the individual.

The quantity of Matter which is submitted to those Absorbing vessels, which perform the office of Restoration, depends upon the quantity of fluid, separated from the Blood by secreting vessels, and by Exhalants.

The quantity of Matter which is submitted to those Absorbents which perform the office of Removal, depends upon the quantity deposited from the blood-vessels, which latter quantity is dependent upon the quantity, and upon the quality, of the Blood, and upon the condition of the several parts of the Vascular System.

It is difficult to ascertain with precision the extent to which Absorption is carried on. For, although an increase of the Waste of the whole Body may arise from a diminution of Absorption, it may also proceed from an increased performance of the processes of Secretion and of Exhalation. So also, although a diminution of the general Waste may result from an increase of Absorption, it may also arise from a diminished performance of the processes of Secretion and of Exhalation. In like manner, with regard to the growth of the Body, an increased deposition of fresh Matter from the blood-vessels, or a diminished performance of the process of Removal, may, alike, lead to an increase of the bulk of the Body. And, on the other hand, a lessened deposition of Matter, or an increase of Removal, may, alike, be the cause of diminution of the bulk of the Body.

So that, when the Waste of the Body is much increased, or diminished, or when the bulk of the Body is increased, or diminished, it often is a point of great difficulty, to ascertain, whether the altered state of action exist in the Absorbing vessels, or in the minute terminations of Arteries. Nor are we much assisted in our investigations on these heads, by the effects of the remedies which we employ for the removal of these altered states, because we cannot explain the *modus operandi* of those remedies.

When, for instance, we succeed in lessening the expenditure of Exhaled, or of Secreted, fluids, the remedies which we employ, may produce this effect, by lessening the processes of Exhalation and of Secretion, or by increasing the process of Restoration. If we procure an increase of the bulk of the Body, the means which we use may effect this, by causing an increased performance of the process of Addition, and a subsequent increase of the deposition of Matter from the blood-vessels, or by causing a diminished performance of the process of Removal. So, on the other hand, when we procure a diminution of the bulk of the Body, or a cessation of its growth, our remedies may produce these effects, by causing a diminution of the process of Addition, and a consequent diminution of the quantity of Matter deposited from the blood-vessels, or by causing an increased performance of the process of Removal.

It may happen, then, in many cases, that, when we consider certain effects to result from an altered degree of Absorption, we may be mistaken; especially, as the Absorbents are so minute, that, when they open on surfaces which are exposed to our view, we are unable to distinguish them.

The introduction of preparations of Mercury into Absorbing vessels, is followed, in many instances, by a diminution of bulk in various parts of the Body, and by a diminution also of accumulations which may have formed, of Secreted, or of Exhaled, fluids; and, as the presence of preparations of this mineral in the Blood, tends to increase the processes of Secretion, and of Exhalation, it is fair to infer, that the diminution of bulk, and of accumulations of Secreted or of Exhaled fluids, which succeeds to the introduction of such preparations into the Absorbents, arises from an increase of Absorption.

The application of Stimulants, is found, in many instances, to procure a diminution of depositions of Matter which have taken place in different parts of the Body, and of accumulations of Secreted, and of Exhaled, fluids; and, since the application of Stimulants is found to increase the processes of Secretion, and of Exhalation, we may infer, that, in such cases, Stimulants increase Absorption. Friction, also increases Absorption, which it may do, by acting as a Stimulant, or by promoting, mechanically, the flow of fluid through the Absorbents.

Pressure will, in many instances, procure the diminution of accumulations of Secreted, or of Exhaled, fluids, or of other depositions which may have taken place from the Vascular System. It may produce this effect, by increasing the processes of Restoration, and of Removal; or by preventing, or diminishing, the deposition of fresh Matter, or the Secretion, or Exhalation, of fluid, in the part impressed, while the process of Absorption, by the Absorbents of that part, continues as before.

A great increase of the Sensibility of the Nervous System, is, generally speaking, followed by emaciation. This effect may result, either from a diminished deposition of Matter from the blood-vessels, or from an increased performance of the process of Removal. As an increase of the Sensibility of the Nervous System, causes, in many instances, a general increase of the process of Secretion, it is probable, that the emaciation which succeeds it, arises, in a great degree, from diminished deposition; nevertheless, as Stimulants appear to increase the action of Absorbents, it is also probable, that, in the case under consideration, the process of Removal may be increased.

The exhibition of Opium, is, in many cases, followed by an increase of emaciation. It can produce this effect, only, by lessening Absorption by those Absorbing vessels which perform the office of Addition; or by lessening the deposition of Matter from the terminations of blood-vessels; or by increasing Absorption by those Absorbents which perform the office of Removal. As Opium, in some instances, increases the Sensibility of the Nervous System, while, in other cases, it lessens that Sensibility, it is probable, that, the effect of this medicine upon Absorbing vessels, may vary in different cases. As an increase of Sensibility appears to favour Absorption, and as Stimulants increase that action, it seems probable, that, when Opium is given in such doses as to increase the Sensibility of the Nervous System, it may also cause an increase of Absorption. But, when Opium is exhibited in such quantities as to lessen the Sensibility of the Nervous System, since, during such a state of that System, the process of Secretion is diminished, while that of Exhalants is increased, we are not warranted in imputing the presence of a diminished quantity of Secreted fluids, in such a case, to an increase of Restoration, since it may be merely the effect of diminished Secretion of those fluids. When therefore, emaciation follows the use of Opium, the exhibition of which has lessened the Sensibility of the Nervous System, it appears probable, that the process of Addition is diminished, owing, perhaps, to the imperfect performance of the processes of Chylification, and of Absorption by the Lacteals; and, also, that the deposition of Matter from the terminations of blood-vessels, is lessened.

The large common trunks of the Absorbents, which open into large Veins near the Heart, receive the tributary streams poured into them from all the branches which are dispersed throughout the Body. There is, then, a continuity of canal, extending from the minute orifices of Absorbents, to the termination of those common trunks in Veins. If, therefore, those common trunks be made to pour their contents into the Veins, an increased quantity of fluid will flow onward from the branches, to supply the place of the fluid so poured out; so that the contents of Absorbents generally may be made to advance in a direction toward the common trunks, in which case, fresh Matter may enter the mouths of the Absorbents. So that an increased evacuation of the common trunks of Absorbents, may induce an increase of Absorption. The action termed Retching, which causes the contents of the Thorax, and of the upper part of the Abdomen, to be pushed upward, has a tendency to force onward the contents of the common trunks of the Absorbents, and, accordingly, we find, that the act of Vomiting, or of Retching, is, in many instances, followed by an increase of Absorption.

Accumulations of Exhaled fluid, or, in other words, Dropsical accumulations, are found to subside after the exhibition of Digitalis, and of Squill. These medicines may excite Retching, in which case, Absorption may arise in the way already explained. If they do not excite Retching, yet if they still produce a diminution of the accumulations, they can only do so, either by causing the Absorbents to take up an increased quantity of the effused fluid, or by preventing, or diminishing, the farther effusion of such fluid, while the process of Restoration goes on as before.

It is easy to comprehend, how medicines, which are admitted into the Alimentary canal may get into the mass of circulating Blood, and how they may, consequently, affect the condition of that fluid, and the state of the vessels in which that fluid is contained. But we cannot well conceive, how such medicines can act upon Absorbents, unless we suppose that they are poured forth from Exhalants, and that they then act upon the mouths of the Absorbing vessels, or that they act upon Absorbents through the medium of the Nervous System. Digitalis and Squill, when admitted into the Alimentary canal, cause an increased secretion of Urine, as do other medicines belonging to the class Diuretics, which also produce the removal of Dropsical accumulations. But neither Digitalis, nor Squill, nor other Diuretic medicines, procure the decrease of Dropsical accumulations, unless they cause an increased production of Urinary fluid, or produce an evacuation of watery fluid by some other outlet. It seems probable, therefore, when the exhibition of Digitalis, of Squill, or of any other Diuretic medicine, is followed by a decrease of any Dropsical accumulation, that such remedy must produce this effect, by causing a suspension, or a diminution, of the process of Exhalation, either by its direct effect upon Exhalants, or, as is more probable, by causing an increased separation of fluid by the Kidnies, in consequence of which, Exhalation is diminished, or suspended. For it is plain, that, if Exhalation be diminished or suspended, while the Absorption of the effused fluid continues to the usual extent, a diminution of the quantity of accumulated fluid must ensue. In short, we seem to be warranted in considering, that, when Diuretic medicines procure the removal of Dropsy, they produce this effect, by their direct influence on the process of Secretion, and by their consequent influence on Exhalation, rather than by their influence on Absorbents.

An increase of Temperature appears to increase the process of Absorption, by those Absorbents, at least, which perform the offices of Restoration and of Removal.

Certain Passions, as Fear and Disgust, appear to increase the processes of Removal, and of Restoration; while Passions of the Depressing kind, such as Grief, appear to increase the process of Removal. As these Passions have a tendency to increase Exhalation, it seems probable, that, when their presence is succeeded by a diminution of Dropsical accumulations, or by a disappearance of fat which has been deposited in various parts of the Body, they exert a direct influence upon those Absorbents which perform the offices of Restoration and Removal, increasing Absorption by those vessels. But we must recollect, that these Passions may lead to the production of emaciation, by their direct influence upon the state of the Alimentary canal, and upon the processes, of Digestion, of Chylification, and of Absorption, which are carried on in that canal, as well as by inducing an increase of Waste, by causing an increase of Exhalation from the surface of the Body.

A diminution of Temperature, and of Sensibility, may be enumerated among the causes of diminished Absorption. A smaller quantity of fluid may pass into and through, Absorbents, in consequence of an obstructed state of those vessels, whether arising from pressure, or from a diseased state of the vessels themselves.

Alimentary Canal.

IF any obstacle exist in the Pharynx, or in the Œsophagus, or in the Cardiac orifice of the Stomach, the Aliment will either not enter the Stomach, or it will be admitted in a smaller quantity. In such a case, the effects of diminished Supply will arise, and the Sensation termed Hunger will continue.

If any impediment exist in the Pyloric orifice of the Stomach, the food will be detained in the Stomach, so that distension of that cavity will be produced, to remove which, those Muscular actions will sooner, or later, take place, of whose contractions, compression of the Stomach, and a consequent evacuation of that receptacle, are the effects; in other words, Vomiting will ensue. During the distended state of the Stomach, the Diaphragm will be pressed upward, and, consequently, the due dilatation of the Lungs, and the due diastole of the Heart, may be impeded.

If any obstruction exist in any part of the Intestines, the passage of food will be impeded;

and as, in such a case, the peristaltic action of the canal will be opposed in its usual direction, that action may be lessened, or it may be inverted; in which latter case, the food will be returned into the Stomach, whence it may be ejected through the Œsophagus, by the act termed Vomiting. If the Duodenum be distended with Aliment, the descent of the Diaphragm may be prevented, and pressure may be made upon the entrance of the common gall-duct, preventing the influx of Bile; in which latter case, the Billiary ducts and the gall-bladder will become distended with Bile, uneasy Sensations will arise, and the circulation of Blood through the Hepatic blood-vessels may be obstructed. From the absence of Bile, greater disorder will arise in the Alimentary canal, and the natural action of that canal will be retarded.

Independently of these effects which result from detention of the food in the upper portion of the canal, much greater mischief will arise from its detention at this part, than when it is detained in the lower portion of the Intestines. For, in the latter case, the food will have been subjected to the action of nearly the whole range of the Lacteals; whereas, if the food be retained in the upper portion of the canal, it will be acted upon by a small part of the Lacteals only, in which case, the Supply furnished to the Blood will be scanty. Besides, as the Sensibility of the upper part of the canal, is greater than that of its lower part, greater inconvenience will be produced by food accumulated in the former situation, than by food detained in the lower portion of the canal. But, if food be accumulated in this latter situation, it will, sooner, or later not only lead to accumulations in the upper part of the Intestines, but it will give rise to an unhealthy condition of the vessels of the canal, it will interfere with the processes usually carried on in the bowels; it will cause uneasy Sensations; it may prevent the free passage of the Blood through the Abdominal blood-vessels, and through those of the lower extremities, and, consequently, it may cause an obstructed state of the whole round of the circulation; and it may give rise to violent Muscular action, which may be set on foot with a view to the dislodgement and removal of the accumulated Matter, from the presence of which all this disturbance arises.

If the passage of food through the Intestines be accelerated, sufficient time may not be allowed for the performance of the processes of Digestion, of Chylification, and of Absorption by the Lacteals. In consequence of a hurried action of the Intestines, and of the imperfect performance of Digestion, the food, when it reaches the Intestines, may be in an unnatural state, and, consequently, the presence of it in the bowels, may give rise to uneasy Sensations, or may cause violent Muscular actions to be set on foot.

The peristaltic action of the Intestines may be retarded, owing to a variety of causes, among which may be reckoned: a deficiency of the Salivary, of the Gastric, of the Pancreatic, or of the Enteric, juices, or a want of the influx of a due quantity of Bile into the Duodenum; a diminished quantity, or an altered quality, of the food; a diseased state of the canal, whether arising from: Inflammation; dilatation; schirrous, or other, thickening, or enlargement, of its coats; adhesions, contractions, or obliterations, of the canal; intus-susceptio; hernia; spasmodic action of the circular fibres; a relaxed state of the inner membranes; worms; concretions; hardened fæces; or other foreign substances; piles; increased action of the Sphincter Ani; pressure made by some body situated externally to the canal, as by enlarged Liver, enlargement of the Uterus, or of any other of the Abdominal viscera, collections of fluid in the cavity of the Peritoneum, stone in the Bladder, pessary in the Vagina, bandages; diminished Sensibility of the Nerves of the canal, whether arising from the action of Sedatives, or from altered states of the Cranial, or Spinal, Brain; enfeebled action of the Abdominal Muscles, or of the Diaphragm; Passions, particularly those of the Depressing kind.

The action of the Alimentary canal may be inverted, in consequence of its being opposed in its usual direction, by any of the causes already mentioned; or from impressions on the Stomach, which give rise to uneasy Sensations, to remove which, those Muscular actions are set on foot, of which Vomiting is an effect, as from unusual ingesta, from increased quantity of food, from the influx of an increased quantity of Saliva, of Gastric juice, or of Bile; from an altered state of those fluids, from worms, or from concretions. The action may also be inverted, owing to an altered state of the Stomach, as from stricture of its orifices; or from diminution of its capacity, whether arising from increased action of its Muscular fibres, from induration of its coats, or from external pressure. Vomiting may also proceed from increased Sensibility of the Nerves of the Stomach, or from erosion of the membrane lining that cavity; or it may be produced by Muscular actions which are set on foot to remove impressions upon other parts, as upon the Fauces, the air-passages, the substance of the Lungs, or upon any of the Thoracic, or Abdominal, Viscera. It may arise from altered states of the Cranial Brain; from rapid succession of objects of sight; from violent Passions; from certain revived Sensations, and from other causes which will be more fully explained, when we come to the investigation of the causes of inordinate Muscular actions.

The peristaltic action of the Alimentary canal, may be increased, in consequence of unusual ingesta; from increased influx of Secreted fluids; from altered states of those fluids; from increased Sensibility of the Nerves of the canal; from unusual impressions on the surface of the canal, as from worms, hardened fæces, &c; from enlargement of the Uterus, or of the Ovaria; from sudden reduction of temperature; from diminished action of the Sphincter Ani; from increased action of the Abdominal Muscles, and of the Diaphragm; from Passions, as from Fear.

If the process of Digestion be imperfectly performed, the Aliment may, to a greater, or less, extent, undergo the Putrefactive, or the Fermenting, process, in either of which cases, a quantity of gas will be extricated, which will cause distension of the Stomach, from which will result an opposition to the descent of the Diaphragm. An acid liquor may be formed in the Stomach, which by its action on the Nerves of that receptacle, may cause uneasy Sensation, which may be referred to the Stomach, to the Pharynx (constituting Heart-burn) or to the Head, causing Head-ache, and inducing disorder of the Cranial Brain. Or the presence of this acid liquor, or of the undigested food, in the Stomach, may cause Vomiting to be produced; on the impression produced by these ingesta on the Nerves of the Stomach, may be communicated to the Heart, producing irregular, and hurried, action of that organ. If the undigested food reach the Intestines, it may give rise to uneasy Sensations, which may be referred to the part impressed, or to the Head, or it may increase the peristaltic action of the canal, or may cause violent Muscular actions to be set on foot with a view to dislodge it. Or the presence of undigested food may cause increased, or a lessened, production of the Enteric juice; or it may produce an increased production of the Mucus lining the canal, or it may induce an irritated state of the Nerves of the canal; it may cause an increased quantity of Blood to be received by the blood-vessels of the bowels; or it may cause a torpid state of the canal.

If the process of Digestion be more extensively performed, the process of Chylification may also be more copiously performed, in which case, all the consequences of increased Addition may ensue.

If the process of Chylification be less perfectly, or less extensively, carried on, the quality of the Supply will be depraved, or its quantity will be lessened.

The presence of an increased quantity of the Mucous fluid which is poured out on the internal surface of the Alimentary canal, may, by forming, as it were, an additional lining to that canal, prevent the free admission of the Chyle into the Lacteals; or it may, by increasing the thickness of the medium interposed between the Alimentary matter and the Nerves of the canal, lessen the impression made by that matter upon those Nerves, and may, by so doing, lessen the peristaltic action of the canal.

The process of Digestion may be imperfectly performed owing to a variety of causes, among which we may reckon: Food of an improper quality, or in improper quantities; imperfect performance of the process of Mastication, in which case, the food will not be sufficiently mingled with Saliva, nor will it be sufficiently broken down and divided; diminished Secretion of Saliva, or discharge of that fluid from the mouth; increased secretion of Saliva; diseased states of the fluids which flow into the Fauces; an altered state of the Gastric, or of the Pancreatic, juices; the presence of an increased, or diminished, quantity of these fluids; an altered state of the Bile; an insufficient quantity of that fluid, whether arising from diminished Secretion, or from some obstruction to its influx into the Duodenum; the presence of too great a quantity of Bile; the flow of too great a quantity of that fluid into the Stomach; diseased condition of the Stomach, whether consisting of simple Plethora, of Inflammation, diminished capacity, inordinate distension, thickening of its coats, partial rupture, ulceration, or displacement; disordered conditions of the Cardiac, or Pyloric, orifices; obstructed states of the Intestines; hurried action of the bowels; increased secretion of Enteric juice; diminished, or depraved, secretion of that fluid; collections of fæces; worms; diminished Sensibility of the

Nerves of the Stomach, whence may ensue diminished secretion of Gastric juice, and diminished action of the Muscular fibres of that cavity; an interruption of the communication between the Cerebral and the Anti-cerebral extremities of those Nerves; increased Sensibility of the Nerves of the Stomach, whence may ensue, increased secretion of Gastric fluid, pain referred to the Stomach, and the production of Vomiting; altered states of the Cranial, and Spinal, Brain; deficiency of Nervous Power; long absence of Sleep; an increase, or a diminution, of temperature, generally, or locally; powerful Sensations; Passions, especially those of the Depressing kind; powerful exertion of the Faculties.

As the process of Chylification is dependent upon the previous process of Digestion, so may all those causes which lead to the imperfect performance of this latter process, produce also an imperfect performance of the process of Chylification.

Pulmonic Process.

IF the Pulmonic process be imperfectly performed, the Blood which flows into the left Ventricle may not be a fit stimulus for the production of contraction of that cavity, in which case, the action of the left Ventricle will be feeble, or irregular. The Tone of the Muscular fibres of the Heart may be lessened, in consequence of the circulation of dark-coloured Blood through the Coronary vessels. The action of the Heart will be principally disordered, in consequence of the disordered condition of the Cranial Brain, which will result from the circulation of dark Blood through the Cerebral blood-vessels. The Momentum of the Blood will be lessened; consequently, Secreted fluids will be more sparingly produced. The process of Secretion will, also, be less perfectly, well as less extensively, performed, in those secreting vessels which are formed of the terminations of Arteries, owing to the altered quality ofhe Blood; and in all Secreting structures, the process will be, more, or less, suspended, in consequence of the deranged condition of the Nervous System. Exhalation will be increased; and all the other consequences of obstructed circulation of the Blood will arise.

The Pulmonic process may be imperfectly performed, owing to some impediment existing to the passage of Atmospheric air, into, and from, the air passages; or from a prevention of the due expansion of the Lungs; or from an altered action of the Respiratory Muscles; or from an altered state of the respired air.

The passage of air, into, and from, the air-cells, may be impeded, by some obstacle existing in the Mouth, or Nostrils, or Posterior Fauces, or Larynx, or Trachea, or Bronchia, or in the cells. Such obstacle may consist of some foreign substance; of diseased growth, as of excrescence, or of a thickened state of the membrane lining these passages, whether caused by Inflammation, or by other disordered states; of Abscesses; of any alteration of structure, whether caused by accident, or by Disease. It may consist of Lymph, which has been deposited from the blood-vessels; of Blood, which has flowed from Exhalants, or from a ruptured blood-vessel; of an increased quantity of those Mucous and Exhaled fluids which naturally flow into these passages, which increased quantity may proceed from an increased flow of those fluids, or of a diminished removal of a portion of them by Absorbing vessels, or by Expectoration; or of Mucus which has become adhesive, in consequence of the evaporation, or absorption, of its watery parts. The obstacle may be offered, by pressure acting externally to the air-passages, as by a ligature placed around the neck; by Aneurism of the Carotid Arteries; by Bronchocele; by other Tumours; by distension of the Œsophagus, whether produced by food, by air, or by other bodies. An increase of the Sensibility of the air passages, may be an indirect cause of a diminished quantity of air being admitted into the air-cells.

The due expansion of the Lungs may be prevented, by an alteration of structure, whether of the tubes, and cells, or of the substance of the Lungs; as by ossification, by abscesses, by Hydatids, by tumours, by condensation of the Lungs; by earthy concretions; by Plethora of the blood-vessels of the Lungs, generally, whether Pulmonary, or Bronchial, and whether the state termed Inflammation, be, or be not, present. Such Plethora may arise, from an increase of the general mass of the Blood, or from more hurried action of the Heart, or from an impediment existing in any part of the round of the circulation. The due expansion of the Lungs may also be prevented, by Anasarca, or by Emphysema, of the Cellular membrane which connects the Bronchia; by adhesions of the Pleuræ; by collections of watery, or of purulent, fluid, or of Blood, or of air, in the cavities of the Pleuræ; by enlargement of the Heart; by dropsy of the Pericardium; by Aneurism of the Aorta; by enlargement of the Thymus gland in infants; by a deposition of fat, or by Abscesses, in the Anterior Mediastinum. The due expansion of the Lungs may be prevented, by some obstacle existing to the enlargement of the capacity of the Thorax, as by ossification of the Cartilages of the Ribs; by deformity of structure; by Anchylosis of the joints between the Ribs and the Spine; by irregular action of the Diaphragm; by an obstacle existing to the descent of the Diaphragm, whether such obstacle consist of distension of the Stomach, or of the Intestines, of Tumours within the Abdominal cavity, of enlargement of the Liver, of the Pancreas, of the Spleen, of the Ovaria, or of the Uterus, of distension of the Gall-bladder, or of the Urinary bladder, or whether it be offered by the presence of watery fluid, or of air, in the Abdominal cavity.

The action of the Respiratory Muscles may be diminished, in consequence of a faulty state of their fibres, arising from a diminution, or loss of Tone; or owing to a want of Nervous Power; or from the Nerves of those Muscles not being fit conductors of that Power; or from a faulty state of the Cranial Brain, or of the upper part of the Spinal Brain; or from the exertion of the Will, causing the action of these Muscles to be suspended; or from the Intellect being engaged in attending to Sensations, or being occupied with Passions, or in exercises of the Faculties, or in directing other Muscular actions. Or the Muscles, by whose contractions the capacity of the Thorax is increased, or diminished, may be engaged in performing other offices, as when the act of Respiration is suspended by those actions, which produce Sneezing, or Hiccough, or Vomiting, or which cause the evacuation of the Rectum, of the Bladder, and of the Uterus; or by actions which produce various motions and contortions of the Body.

The air which is respired, may be deficient as to quantity, or it may be too much rarified, or it may contain noxious particles, or it may consist of some noxious gas, or its composition may be altered from the natural constitution of the Atmosphere.

The Pulmonic process may be more freely, and more perfectly, accomplished, owing to the admission of an increased quantity of air into the air-cells of the Lungs; or from the more free passage of the Blood through the Pulmonic circuit; or from an altered state of the respired air,

The admission of an increased quantity of air into the air-cells of the Lungs, must arise from an increase of the capacity of the Thorax, and, consequently, it is produced by increased action of the Respiratory Muscles, and it is dependent upon the extent to which the capacity of the Thorax can be increased. For, although the action of those Muscles be increased, yet, if an impediment exist to the enlargement of the capacity of the Thorax, that action cannot lead to the admission of an increased quantity of air into the Lungs. In order, then, that a larger quantity of air be admitted into the air-cells, it is, necessary, not only that the actions of these Muscles be increased, but that no impediment exist to the enlargement of the capacity of the Thorax to its full extent,

The action of the respiratory Muscles may be increased, by the exertion of the Will; or in consequence of an increased production of Nervous Power; or owing to the Nerves of those Muscles being rendered more ready conductors of that Power; or in consequence of an increase of Tone in the fibres of those Muscles.

Less impediment may exist to the enlargement of the capacity of the Thorax, owing to a diminution of the mass of Blood; or from a diminution of the quantity of Aliment in the Alimentary canal; in short, from the diminution, or the removal, of any mechanical obstruction, whether existing in the cavities of the Thorax and the Abdomen, or situated externally to those cavities,

The Blood may flow more freely through the Pulmonic circuit, in consequence of a diminution of the general quantity of that fluid; or owing to increased action of the Heart; or from an increased freedom of passage throughout the whole range of the circulation.

That alteration of the respired air which tends to increase the performance of the Pulmonic process, consists of a less rarified state of the Atmospheric air, or of a more pure quality of that air, or of an increased proportion of Oxygen gas in its composition,

Cranial Brain.[*]

IF Erethism of the Cranial Brain be induced, there will be, an increase of Sensibility throughout the Nervous System; an absence of sleep; an irritable state of the Intellect; probably, also, an active, animated, state of the Intellect; an increased production of Nervous power; an increase of temperature: an active state of Muscles; accelerated action of the Heart; increased Secretion. In consequence of the increased Sensibility of the Nerves of the Alimentary canal, as well as from the presence of an increased quantity of Secreted fluids in that canal, the peristaltic action of the Intestines will be increased.

Erethism of the Cranial Brain may also lead to an accumulation of Exhaled fluid in the Ventricles of that substance, which it can only effect, by increasing Exhalation, or by lessening Absorption.

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[*] See my "Remarks on Affections of the Cranial Brain in Infants," Transactions of the Association of the King's and Queen's College of Physicians in Ireland. Vol. iii.

An Erethismal state of the Cranial Brain may also cause an increased quantity of Blood to flow through the Cerebral Arteries, not only by increasing the action of the Heart, but by its direct influence on those Arteries, the Tonicity of which it must, consequently, diminish. Such increase of the quantity of the Blood which flows through Cerebral Arteries, existing in combination with an Erethismal state of the Cerebral substance, constitutes, as I imagine, Inflammation of the Cranial Brain.

A high degree of Erethism of the Cranial Brain is generally succeeded, sooner, or later, by an opposite condition, or Torpor, of that substance.

If Inflammation of the Cranial Brain be present, the Sensibility of the whole of the Nervous System will be much increased. Nervous Power and Heat will be more copiously produced; there will be, wakefulness and restlessness; the action of the Heart will be increased; the state of the Alimentary canal will be disordered: painful Sensations will be present, referred to the Head, the functions of the Intellect will be much disturbed, and the faculties will be greatly disordered: Muscular action may be powerfully, or involuntary, performed.

Inflammation of the Cranial Brain may also lead to increased effusion from the Cerebral Exhalants: or to the effusion of a purulent fluid into the substance of that Brain, or it may induce disorganization of that structure.

If a Torpid state of the Cranial Brain be induced, the Sensibility of the whole of the Nervous System will be lessened; the production of Nervous Power and of Heat will be diminished; the action of the Heart will be lessened; the action of the Tonic Power of the smaller Arteries will be increased; Secretion will be diminished; Exhalation will be increased; the action of the Alimentary canal will be retarded, or inverted; the processes of Digestion, and of Chylification, will be imperfectly performed; Muscular action will be lessened, or it will be performed involuntarily, or irregularly: Respiration will be imperfectly performed; the Pulmonic process will be imperfectly accomplished; a comatose will be present: and the functions of the Intellect will be, more, or less, suspended.

There are many other morbid conditions of the Cranial Brain, besides those which have been enumerated, but it is not necessary to particularize them here, my present object being, to shew, that deviations from the Healthy state, occurring in the Cranial Brain, will induce disorder of the whole œconomy.

Erethism of the Cranial Brain may exist as an effect of original structure of that substance. It may arise from an altered condition of that substance, whether produced by the presence of foreign bodies, or of tumours; by induration, or ossification of the Dura Mater; by thickening of the inner table of the Cranium, or by Spicula proceeding from that table; by an increase of the quantity of Blood that circulates through the blood-vessels of the Cranial Brain, and of its membranes; by increased velocity of the motion of that Blood; by an altered state of that fluid; by certain substances taken into the Stomach; by concussion; by an increase of temperature; by the long absence of sleep; by a similar state of the Spinal Brain. It may also be produced by impressions upon the anti-cerebral extremities of Nerves; as by the action of Light on the Retina; by pressure made on the Gums by the Teeth, during the process of dentition; by impressions on the Alimentary canal, whether produced by Worms, by the presence of an increased quantity of Secreted fluids in that canal, or of Secreted fluids whose quality is unnatural, by undigested food, by hardened fæces, or by food of an unusual quality; by impressions on the Liver, whether produced by tumours, by congestion of Bile in the Biliary ducts, or, of Blood in the blood-vessels of that organ; or by impressions upon any other of the Viscera. It may arise from the influence of Passion, as from Anger, or Grief; or from powerful exertion of the Faculties.

As an increase of the quantity of Blood that flows through the Cerebral blood-vessels, may induce Erethism of the Cranial Brain, so may it proceed from that state of that Brain. Inflammation being, then, as I conceive it to be, Erethism existing in combination with Plethora of the blood-vessels, it follows that, those causes which induce Erethism of the Cranial Brain, may also induce Inflammation of that substance.

Torpor of the Cranial Brain may be a consequence of previous Erethism of that substance. It may arise from any cause that produces increased compression of the Cranial Brain; thus, it may proceed from a Plethoric state of the Cerebral blood-vessels, from an Aneurismal state of the Cerebral Arteries, from congestion of Blood in the Cranial Sinuses, from accumulation of watery fluid in the Ventricles, or between the membranes, from effusion of Blood, from collections of Pus, from tumours, from thickening, or indentation, of the inner table of the Cranium. It may also be produced by Concussion, by loss of some of the Cerebral substance, by some peculiar alteration of the structure of that substance, or it may be connected with, and dependent upon, original formation. It may arise from diminution of the quantity of Blood that flows through the Cerebral blood-vessels, or from an altered state of that fluid. Thus, it may arise from loss of Blood, from diminished action of the Heart, from extreme cold, from disordered performance of the Pulmonic process, from vitiated Atmosphere, from the respiration of Carbonic acid gas. It may be caused by intoxication, by Sedatives, externally applied, or internally administered, by great expenditure of Nervous Power. It may proceed from a morbid state of the Alimentary canal, from worms, from accumulations of fæces, from disordered state of the mucous membrane of the canal, from disease of the Mesenteric glands, from congestion of Bile in the Biliary ducts, or from other faulty states of that viscus. It may arise from the powerful, or long-continued production, of Sensation, from the influence of powerful Passions, or from powerful, or long-continued, exercise of the Faculties.

Spinal Brain.

ANY alteration occurring in the state of the Spinal Brain, may, in the first instance, affect, principally, the condition of those Nerves which are connected, by their Cerebral extremities, with that Brain, at, or below, the part affected. If, for instance, the alteration occur in the lower part of the Spinal Brain, the Nerves of the Pelvis, and of the lower extremities, may be principally affected. If it occur higher up, it may affect, not only these Nerves, but some of those which are distributed throughout the cavity of the Abdomen, and the Abdominal Muscles. If the alteration occur in the upper part of the Spinal Brain, it will produce a disordered state, not only of all these Nerves, but of those also which are distributed throughout the Thorax, and the upper extremities.

But although the more direct and immediate effects of an altered condition of the Spinal Brain, may be chiefly limited to those parts whose Nerves are connected, by their Cerebral extremities, with the Spinal Brain, at or below, the part affected; yet the altered condition of these Nerves may ultimately induce disorder of the whole Nervous System, and it will, sooner, or later, lead to disorder of the whole œconomy. Besides, an altered condition of one part of the Spinal Brain will, more, or less, alter the condition of the whole of that Brain, and will, sooner, or later, alter also the condition of the Cranial Brain.

If there be an Erethismal state of the Spinal Brain, the Sensibility of the Trunk, and of the extremities, may be increased; inordinate, and involuntary, actions may take place in the Muscles of the Trunk and of the extremities, the Body may be bent backwards by the action of the Dorsal Muscles, or it may be bent forwards by the action of the Abdominal Muscles. In consequence of the inordinate actions of these several Muscles, the act of Respiration may be hurried, or irregularly performed, or suspended; and inordinate compression being made on the contents of the Abdominal cavity, the action of the Alimentary canal may be quickened, and the contents of the canal may be too rapidly evacuated. The process of Secretion may be increased in all those Secreting structures, whose Nerves communicate with the Spinal Brain. Painful Sensations may be present, which may be referred to the Back, or to the Head. Wakefulness, and restlessness, may be present; together with impatience, and fretfulness of temper.

An Erethismal state of the Spinal Brain may cause the Arteries of that structure to receive an increased quantity of Blood, in which case, Inflammation of that Brain will be present, during the existence of which, all the effects of the Erethismal state will be present in a still greater degree.

If Torpor of the Spinal Brain be induced, there will be a diminution of Sensibility, of Temperature, and of Muscular action, throughout the Trunk, and the extremities. Respiration will be imperfectly performed. The process of Secretion will be diminished in those Secreting structures whose Nerves are connected principally with the Spinal Brain. In consequence of the diminished temperature of the surface, the Tonicity of the smaller Arteries of the surface will be increased. The action of the Alimentary canal will be retarded. The Sphincters which guard the outlets of the Bladder and of the Rectum will lose their power, so that those cavities may be evacuated involuntarily. Sensation will be sparingly produced by impressions on the Trunk, or on the extremities, or painful Sensations may be referred to these parts.

Other disordered states of the Spinal Brain may occur, but enough has been said to shew, that an altered state of this substance will lead to derangement of the whole œconomy.

An Erethismal state of the Spinal Brain, may be the effect of original structure. It may arise from an increased quantity of Blood circulating through the blood-vessels of the Spinal Brain, or of its investing membranes, or from an altered quality of that Blood, or from its flowing with increased velocity. It may be the consequence of a similar state existing in the Cranial Brain. It may arise from concussion, from the presence of tumours, or of a foreign substance, from a thickening of the Theca Vertebralis, or of the investing membranes, from increase of temperature, or from impressions upon Nerves which are connected, by their Cerebral extremities, with the Spinal Brain.

As Inflammation of the Spinal Brain, may be a consequence of Erethism of that substance; so may it proceed from any of those causes which give rise to this latter state.

Torpor of the Spinal Brain, may be the consequence of previous Erethism of that substance. It may arise from whatever produces undue compression of the Spinal Brain, as from fracture, and dislocation of the Vertebræ; from curvature of the Spinal column; from thickening of the Theca Vertebralis, or of the investing membranes; from Plethora of the blood-vessels of the Spinal Brain, or of its membranes; from congestion in those vessels; from effusion of Blood, of Pus, or of watery fluid, within the Vertebral cavity; or from the presence of foreign substances. It may arise from the abstraction of Heat, from concussion, or from wounds.

Sensibility of Nerves.

If the Sensibility of Nerves be generally increased, Sensation will be more readily, and more copiously, produced, so that impressions which usually fail to produce Sensation, may then give rise to a high degree of it. The action of the Heart will be increased both in force, and in frequency. The Toniciity of the smaller Arteries may be lessened. The process of Secretion will be generally increased. In most cases, a great increase of the Sensibility* of the Nervous System is followed by a diminution of Exhalation. The Temperature will be raised. Muscular action will be more freely performed. The increased Sensibility of the Alimentary canal, may cause uneasy Sensations to arise from impressions upon it, which do not, usually produce that effect. The Secreted fluids in that canal, which will be present in an increased degree, in consequence of the general increase of Secretion, may give rise to unpleasant Sensations, or the same effect may result from ordinary food; and, to relieve these Sensations, those Muscular actions may be called forth, of which Vomiting is an effect. Or the peristaltic action of the canal may be hurried, and this increased action, aided by other Muscular actions, may produce Diarrhœa. The processes of Digestion and of Chylification may be imperfectly performed, or, if the general increase of Sensibility be confined within certain bounds, those processes may be more freely, or more perfectly, performed. The increased Sensibility of the Nerves of the air-passages, may cause uneasy Sensations to arise from impressions which usually fail to produce Sensation, and, to remove these Sensations, those Muscular actions may be called forth, of whose contractions Coughing is an effect, or the action of the Respiratory Muscles may be hurried. As an increase of the Sensibility of Nerves causes an increased degree of Sensation to arise from impressions, so may it induce an altered state of the Cranial, or Spinal, Brain. It may induce an Erethismal condition of these structures. The state of the Intellect will be affected in a variety of ways; the temper will be fretful and impatient.

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* There are two kinds of Habits, or Temperaments, in each of which there is an unusual degree of Sensibility of the Nervous System generally. In the one, there is a great disposition to the production of Heat, in the other, there is a great disposition to a diminution of Temperature. In the one, any sudden alarm, or agitation of Mind, or bodily pain, induces great increase of Temperature, which is attended with dryness of the skin, and with quickened action of the Heart; in the other, such Mental affections are attended with great coldness of the Body, diminished action of the Heart, and profuse perspiration. In the one the skin is scarcely ever moist, and the pulse is rarely slow; in the other, the skin is generally damp, and the pulse is rarely frequent. In the one, there is great Muscular strength and activity, while the other, is delicate, and feeble. In the one, there is generally, an active, acute, Mind, whose energies are called forth by Passions, or by Pain; in the other, there is rather a feeble, dispirited, state of Mind, which, by powerful Passions, or by Pain, is rendered inert.

As an increase of the Sensibility of Nerves tends to lead to an irritated state of those Nerves, and as it tends also to cause an increased quantity of Blood to flow through the Arteries in the neighbourhood of those Nerves, so does it tend to produce the state which is termed Inflammation, a term which implies the existence of an irritated state of Nerves, in conjunction with an increased flow of Blood into Arteries.

If the Sensibility of the Nervous System be diminished, Sensation will be less readily, and less copiously, produced. The action of the Heart will be lessened. The Tonicity of the smaller Arteries will be increased. Muscular action may be feebly performed, consequently, the Pulmonic process may be imperfectly accomplished. The process of Digestion will be imperfectly performed, and the action of the Alimentary canal will be retarded. The Temperature of the Body will be lessened. From all these causes, the Intellect will be affected in a variety of ways.

An increase of the Sensibility of Nerves, may arise, from Erethism, or from Inflammation, of that Brain with which their Cerebral extremities are connected; from an increase of the quantity, or from an alteration of the quality, of the Blood that circulates through the blood-vessels in their neighbourhood; from the application of Stimulants; from an increase of Temperature; or in consequence of less frequent, or less powerful, impressions upon those Nerves.

The Sensibility of Nerves may be lessened, in consequence of Torpor of that Brain with which their Cerebral extremities are connected, or from pressure applied between their Cerebral and their Anti-cerebral extremities; from a diminution of the quantity of Blood that flows through the blood-vessels in their neighbourhood; from an altered quality of that Blood; from the application of Sedatives; from a diminution of Temperature; or from frequent, or long-continued, or powerful, impressions upon those Nerves.

Nervous Power.

If the Nervous Power exist in increased quantity, all those functions which are dependent upon, or are influenced by, the presence of that Power, will be increased. The action of the Heart will be increased. The process of Secretion will be more extensively performed. Muscular action will be more powerfully performed, consequently, the act of Respiration, and the Pulmonic process dependent thereon, may be more freely accomplished. The process of Digestion will be more extensively carried on. The action of the Alimentary canal will be quickened.

If the Nervous Power exist in diminished quantity, effects, the reverse of all those which have just been enumerated, will arise.

The presence of an increased quantity of Nervous Power, may proceed from the increased production, or from diminished expenditure, of that Power.

An increased production of Nervous Power, may arise from an altered state of the Cranial, or Spinal, Brain; whether such state consist of Erethism, of Inflammation, or, (within certain limits) of simple Plethora, or be some state different from either of those states, arising from the effect of increased temperature, or from the action of Stimulants, or from the influence of powerful Passions.

The expenditure of Nervous Power may be lessened, owing to a diminution of Muscular action, or owing to the Body being kept in an equal, moderate, degree of temperature.

The presence of a lessened quantity of Nervous Power, may arise from diminished production, or from increased expenditure, of that Power.

A diminished production of Nervous Power may proceed from various degrees of Torpor of the Cranial, or Spinal, Brain, in what way soever induced.

Increased expenditure of Nervous Power may be the consequence of increased Muscular action, or of the efforts made by the œconomy to preserve the natural temperature of the Body in a cold medium.

Temperature.

If the Temperature of the Body be generally increased, there will be a general increase of the Sensibility of the Nervous System. The action of the Heart will be increased. The Tonicity of the smaller Arteries will be lessened. Secretion will be increased. Exhalation may be increased, but, when there is a great increase of the temperature of the Body, resulting from the evolution of an increased quantity of Heat, under a state of increased Sensibility of the Nervous System, the process of Exhalation is usually diminished. In consequence of the increased Sensibility of the whole Nervous System, the Cranial and the Spinal Brains will more readily have their condition altered by impressions upon any parts of that System. Nervous Power will be more copiously produced. Sensation will be more readily produced. If the temperature of the Body be much raised, the Tone of Muscular fibres will be lessened, in which case, Muscular action will be less powerful.

If the Temperature of the surface of the Body be increased, the Tonicity of the superficial Arteries will be increased, and the capacity of the Veins of the surface will also be increased. So that a smaller proportion of the Blood will be contained in the larger blood-vessels, and in those which are situated more internally. The general round of the circulation, then, may be more free. The surface of the Body will be florid, and its Sensibility will be increased.

If the Temperature of the Body generally, be diminished, there will be a general diminution of Sensibility; the action of the Heart will be lessened; the Tonicity of the smaller Arteries will be increased; Secretion and Exhalation will be diminished; Blood will be congested in the Veins; the whole round of the circulation will be, more, or less, obstructed; general Torpor of the Nervous System will arise, not only from the direct effects of diminished Temperature upon that System, but from the obstructed state of the circulation, and from the consequent congestion of Blood in the Cerebral Sinuses, as well as from the imperfect performance of the Pulmonic process, which will be the consequence of the lessened action of the Respiratory Muscles, as well as of the obstructed state of the Vascular System. Muscular action will be feebly performed. Sensation will be sparingly produced; and all the functions of the Intellect will be feebly performed, or may be suspended; and a comatose state may be induced.

If the Temperature of the surface of the Body be diminished, the Tonicity of the superficial Arteries will be increased. Exhalation from the surface will be lessened. An increased quantity of Blood will flow into those Arteries which are situated more internally, and consequently, an increased quantity must pass by the terminations of those vessels; so that Secreted fluids may be more copiously furnished, and the flow by internal Exhalants may be increased. The action of the Heart may be lessened, owing to the increased resistance which is offered to it. The Sensibility of the surface will be lessened. All these effects may lead, as we have seen, to various derangements of the whole œconomy.

When the Temperature of the Body is reduced, by the abstraction of Heat, an effort is made, by the Nervous System, to replace that Heat so abstracted, so as to keep up the temperature of the Body to the usual standard. The abstraction of Heat, then, although it produce a sense of coldness for a time, is, nevertheless, in many instances, followed by a sense of warmth. If, however, the abstraction of Heat be carried on to a great extent, the efforts of the Nervous System to keep up the usual standard of temperature, will be unavailing, and a torpid state of that System will succeed, during the continuance of which, the temperature of the Body will be much reduced, and the Sensibility of the whole Body will be much lessened.

The Temperature of the Body may be increased, in consequence of an increased quantity of Blood being distributed throughout the Body generally; or from an altered state of the Cranial, or Spinal, Brain, whether such state consist of Erethism, of Inflammation, or of simple Plethora; or from an altered state of the Nerves, whether arising from an altered condition of the Brain with which their Cerebral extremities are connected, or from the application of Stimulants, or from the circulation of an increased quantity of Blood in the blood-vessels in their neighbourhood, or from an altered state of that Blood; or from a more extensive, or more perfect, performance of the Pulmonic process, Or an increase of Temperature, locally, or generally, may arise from the influence of Passions, as from Joy, Fear, &c. Or it may be caused by the Body being placed in a warmer medium.

The Temperature of the Body may be lessened, owing to a diminution of the quantity of Blood distributed throughout the Body generally; or from Torpor of the Nervous System, locally, or generally, in whatsoever way produced; or from an interruption between the Cerebral and the anti-cerebral extremities of Nerves; or from less extensive, or less perfect, performance of the Pulmonic process; or from the influence of Passion; or from the abstraction of Heat.

Muscular Action.

IF Muscular action be performed very generally, and to a great extent, the action of the Heart will be accelerated; Secretion will be promoted; Exhalation will be increased; the action of the Alimentary canal will be quickened; an increased quantity of Blood will flow through the blood-vessels belonging to Muscles, the motion of Blood through those vessels will be accelerated; the expenditure of Nervous Power will be increased; the Temperature of the Body will be raised. If the Muscular actions be continued for a length of time, a sense of fatigue will arise, followed by a disposition to sleep, and by general langour and torpor of the whole Nervous System, as well as by an enfeebled state of the Intellectual functions.

If Muscular action be less extensively, or less powerfully, performed, such general diminution of that action will have a negative effect in producing results, the opposite to those which arise from an increase of that action. There will, in such a case, be, probably, a diminution of Secretion; the act of Respiration will be imperfectly performed; Nervous Power will be less copiously expended, and it will also be less copiously produced; the action of the Alimentary canal will be retarded. Want of appetite, indigestion and its consequences, may ensue, and a general want of energy may prevail throughout the whole of the Bodily and Intellectual functions.

Muscular actions are, in many cases, set on foot, to get rid of some substance, which, by impressing a part of the Body, gives rise to an uneasy Sensation. Thus, the uneasy Sensation produced by the presence of a certain quantity of fluid in the Urinary Bladder, or of fæces in the Rectum, calls forth the contraction of Muscles, which, by lessening the capacity of the cavities which these impressing substances respectively occupy, causes the expulsion of those substances, and, by so doing, gets rid of the Sensation. In like manner, if there be any uneasy Sensation which is referred to the air-passages, the patient calls into action a variety of Muscles, the effect of whose united action is the hasty and forcible expulsion of air from the Lungs, through the Trachea, and the Fauces, the Trachea being, at the same time, drawn upward and elongated, so as to allow the air, during its exit, to act on the whole extent of the inner surface of the air-tubes. The Muscles, which, in this case, are called into action, are, those of the Larynx, of the Neck, of the Thorax, of the Abdomen, and of the Diaphragm. The hasty and forcible expulsion of air from the Lungs, resulting from the united actions, of these Muscles, is called Coughing. If, then, the unpleasant Sensation arise from the presence of effused Lymph, of Mucus, or of any other substance, in any part of the air-passages, which the forcible action of the air can dislodge and expel, the act called Coughing will get rid of the Sensation, by getting rid of the impressing body, and having so done, the Muscular actions, of which Coughing is an effect, will cease.

In some cases, where an uneasy Sensation is referred to the air-passages, it arises from an impression made by some substance which is seated so firmly in these parts, that the forcible expulsion of air from the Lungs cannot dislodge it. Thus, effused Lymph, inspissated Mucus, or some foreign substance, may adhere so firmly to the internal surface of the air-passages, that the air in its exit cannot remove them. In such cases, the act termed Coughing will continue although its efforts are unavailing. Tubercles, or Vomicæ, in the substance of the Lungs, will keep up an uneasy Sensation, for the removal of which Coughing will take place, yet the Muscular actions cannot get rid of the Sensation, because they cannot procure the removal of the impressing body.

In other cases, the uneasy Sensation, for the removal of which Coughing is produced, does not arise from unusual impressions, nor from excessive degrees of ordinary impressions, but from increased Sensibility of the Nerves of the air-passages. This increased Sensibility may be confined to these Nerves, or it may exist also throughout the whole of the Nervous System. Or the increased Sensibility of these Nerves may be connected with an inflamed state of the lining of the air-passages. An abraded state of that lining will produce the same effect as an increase of Sensibility in the Nerves.

In some cases, the uneasy Sensation, for the removal of which Coughing is induced, arises from the inhalation of certain noxious gases, or of atmospheric air whose quality has been altered, or whose temperature is much reduced.

As Sensation is generally referred to the part upon which the corresponding impression is made, so any Sensation which is referred to the air-passages, may produce Coughing, although the impression, from which such Sensation arises, may be made upon some other part, Thus, although the Sensation which is termed Heart-burn, arises from an impression made on the anti-cerebral extremities of Nerves in the Stomach, yet, as the Sensation is referred to the Larynx, Coughing is set on foot with a view of getting rid of the impression, which it cannot effect, because the cause of the Sensation is seated in the Stomach.

In like manner, other impressing substances, in the Stomach, in the Biliary ducts, or in the Intestines, may produce uneasy Sensations which are referred to the air-passages, to remove which, Coughing may be set on foot, although that act cannot procure the removal of the impressing body which gives rise to the Sensation.

An increase of the quantity of Blood that is contained in the Pulmonic blood-vessels, may give rise to an uneasy Sensation, to remove which, Coughing may be induced, although that act will be unavailing.

In short, whatever interferes with the due dilatation of the Lungs, or produces an uneasy Sensation which is referred to the air-passages, may give rise to those Muscular actions, of which Coughing is the effect. Thus, any unusual impression on the air-passages; any increased degree of ordinary impressions upon these parts; an increase of the usual flow of fluid by the Exhalants, or by the Mucous ducts, which open upon the internal surfaces of these passages, or a diminished Absorption of those fluids; the presence of inspissated Mucus, arising from the absorption, or from the evaporation, of its watery parts; the instillation of any fluid into the air-tubes, whether of water, of Blood, or of Pus, &c; an unnatural state of the Atmosphere; the respiration of certain gases; increased Sensibility of the Nerves of the air-passages; abrasion, or ulceration, of the membrane lining those passages; inflammation of any part of those passages; congestion in the Pulmonic blood-vessels, arising from disorder of any part of the Vascular circle; or from an increase of the general mass of the Blood; certain diseased states of the substance of the Lungs, whether consisting of Tubercles, of Vomicæ, of Calculous concretions, &c; diseased states of the air-tubes; anasarca of the Lungs; enlargement of the Heart, or other diseased states of that organ; dropsy of the Pericardium; Hydrothoras; Empyema; diseased states of the Pleura; diseased states of the Liver; calculous, or other concretions or obstructions in the Biliary ducts; diseased Pancreas; unusual impressions in the Alimentary canal, whether in the Œsophagus, Stomach, or Intestines; all these may severally call forth those Muscular actions which produce the effect called Coughing.

Sneezing is the forcible expulsion of air through the Nostrils, which is effected by the united actions of the Diaphragm, and of the Muscles of the Abdomen and of the Thorax. These actions are called forth by the presence of a Sensation which is referred to the membrane lining the Nostrils, and they are set on foot with the intention of removing the Sensation by procuring the removal of an impressing body. Thus, the presence of an increased quantity of Mucus, or of the fluid poured out from the Lachrymal gland, or of dust, or of certain gaseous fluids, or of a feather, in the Nostrils, may severally induce Sneezing. But the Sensation, for the removal of which Sneezing is induced, may arise from an impression made by some substance which the forcible action of the air expelled through the Nostrils cannot dislodge, as when the Sensation is produced by a Polypus in the Nostril. Or the Sensation may be referred to the Nostril, while the impression which gives rise to it is made on some other parts, as when the action of Light on the Eye, induces Sneezing. In other cases, the Sensation, for the removal of which Sneezing is induced, arises, neither from unusual impressions, nor from increased degrees of ordinary impressions, but from an increase of the Sensibility of the Nerves belonging to the Nostrils. Abrasion of the Cuticle which lines the Nostrils, may produce effects similar to those which arise from increased Sensibility of the Nerves. In short, Sneezing is merely the forcible expulsion of air through the Nostrils, produced by the united actions of several Muscles, which actions may be called forth by a variety of causes.

I have already observed, that the uneasy Sensation arising from the presence of Urine in the Urinary Bladder, as well as that which is produced by the presence of fæces in the Rectum, calls forth certain Muscular actions, which, by lessening the capacity of these cavities, cause the expulsion of the impressing substances, and, by so doing, get rid of the Sensation. The Muscles, which are called into action, in these cases, are, the Diaphragm, and the Muscles of the Abdomen, of the Pelvis, and of the Perineum. The expulsion of fluid from the Urinary Bladder is also, in part, accomplished by the contraction of the Muscular fibres of the Bladder. An uneasy Sensation which is referred to the Uterus may also call forth the contraction of these sets of Muscles, and as such contraction lessens the capacity of the Abdominal and Pelvic cavities, it will cause compression of the Uterus, and, consequently, a diminution of its capacity; it may therefore procure the expulsion of the impressing substance from the cavity of the Uterus, and, by so doing, it will get rid of the Sensation. Thus, the actions of these Muscles may cause the expulsion of a Fœtus, of the Placenta, of Coagula, or of Hydatids, from the Uterus, in doing which they are assisted by the contraction of the Muscular fibres of the Uterus.

In many cases, however, the contractions of these Muscles will not succeed in removing the cause of the Sensation. Thus, when there is a Calculus in the Urinary Bladder; when there is an irritable state of that Bladder, arising from an affection of the Kidnies, from increased Sensibility of the Nerves of the Bladder, from Gouty, or Gonorrhœal, or common Inflammation, or from a denuded state of the coats of the Bladder; when there is an enlargement of the Prostate gland, or a thickened state of the coats of the Bladder; in either of these cases, the contractions of these Muscles may be called forth, to assist the contraction of the Muscular fibres of the Bladder, although these united actions will not succeed in removing the cause of the Sensation. So also, where there are Hæmorrhoidal excrescences, or other diseased states of the lower part of the Rectum, or where the Sensibility of the Nerves of that part of the Intestines is increased; in all these cases, the actions of these Muscles, although they will be ineffectual, may, nevertheless, be called forth. In cases of Polypus, or other, tumours of the Uterus, or of enlarged Uterus, of inflammation of that organ, of prolapsed Uterus, or where a Pessary is fixed in the Vagina, the actions of these Muscles may be called forth, although they will not succeed in removing the cause of the Sensation.

In many cases, where the presence of a substance which impresses the inner membrane of the Stomach, give rise to an uneasy Sensation, a set of Muscular actions is called forth, whose contractions, by compressing the Stomach, lessen its capacity, and, by so doing, cause its contents to be ejected through the Œsophagus and the Mouth, and thus, by getting rid of the impressing substance, they procure a removal of the Sensation. The Muscles, which, in such cases, are called into action, are those of the Abdomen, of the Thorax, and of the Throat. The effect of the united actions of these Muscles is called Retching, and, if any thing be ejected from the Stomach, it is termed Vomiting.

In many cases, the Sensation which causes the united actions of these Muscles to be called forth, arises from increased Sensibility of the Nerves of the Stomach. In these cases, uneasy Sensations will arise from impressions, which, in the usual state of those Nerves, did not give rise to Sensation. Where this Sensibility is increased in a very great degree, the presence of the least possible quantity of solid, or of liquid, food, taken into the Stomach, or of fluid which flows into it from its own vessels, may produce uneasy Sensations, for the relief of which, Retching may be excited. In a case of this kind, the act of Retching will be perpetually repeated, because, in spite of the most forcible contraction of those Muscles, some small portion of substance may yet remain behind, or, at all events, the relief afforded will be of short duration.

In other cases, uneasy Sensation may arise from Inflammation of the Stomach, in which case, the act of Retching will take place, although it cannot remove the Sensation.

In many cases, the act of Retching is called forth by what I have termed Revived Sensation, as when the mention, or the sight of a substance, which has formerly excited vomiting, causes the act of Retching to be reproduced, although there be no impression repeated on the Stomach. Whatever produces great disgust, as the mention, or the sight, of a disagreeable substance which may never have been admitted into the Stomach, may bring on Retching.

Some Passions have a direct influence in producing a state of the Stomach, to remove which the act of Retching is performed.

The same set of Muscular actions as those which produce Retching, will also be called forth by Sensations which are referred to other parts, although the impressions which give rise to those Sensations may not be removed by those actions. Thus, the presence of Biliary Calculi in the ducts of the Liver, or in the common Gall duct, diseased state of the Liver, of the Pancreas, of the Heart, of the Diaphragm, calculus of the Kidney, imflammation of the Kidney, may, severally, induce those Muscular actions, of which Retching is a result. Yet, in these cases, those actions will not get rid of the impressing substance, unless, perhaps, in the case of calculus of the common gall-duct, in which, the compression and the straining produced by these actions may dislodge the calculus, and, by forcing it into the Duodenum, or into the gall-bladder, may, thus, get rid of the Sensation.

From whatever cause, the actions of these Muscles are set on foot, their effect, as far as regards the Stomach, will be the same. Thus, although they be called forth by an impression on the Heart, on the Liver, or on the Kidney, yet, in as much as they produce a diminution of the capacity of the Abdomen, they will cause compression of the Stomach, and, consequently, Vomiting may take place to as great a degree as if the actions had been caused by an impression on the Stomach. The act of Retching, in these cases, does not arise from any connection between the parts which are impressed, and the state of the Stomach, but from compression being made on that cavity in which the Stomach is situated.

The contraction of the Abdominal Muscles, aided by that of other Muscles, produces a diminution of the capacity of the Abdominal and Pelvic cavities, and by so doing, it procures, as I have already stated, expulsion of the substances from the Rectum, from the Bladder, and from the Uterus. There is, generally, a short and ready outlet by which Substances can escape from these several cavities, so that these

Muscular actions, in a majority of cases, succeed in procuring the evacuation of these cavities. In come cases, however, these actions fail to dislodge the impressing substances from these cavities, and, as, in these instances, those actions, are very powerfully, although ineffectually, exerted, since they have the effect of compressing the whole of the contents of the Abdomen, they may force from that cavity a portion of its contents, by any passage which is less obstructed than those passages which they fail to force open. Thus, from violent, but fruitless, efforts to evacuate the Rectum, or the Bladder, or the Uterus, Hernia may be produced, or a portion of the contents of the Alimentary canal may be ejected through the Œsophagus. In these cases, if Vomiting arise, it does not prove the existence of any connexion between the state of the Stomach, and that of the other parts which I have mentioned, but it is merely the effect of mechanical pressure, which forces a part of the contents of the Abdomen by the most ready outlet. In these cases, if the obstruction to the exit of the impressing substance from the Rectum, or from the Bladder, or from the Uterus, be removed, that substance will be expelled by the Muscular actions, and the Vomiting will cease.

In all cases, where the Sensation which the patient wishes to get rid of, arises from an impressing body situated in any part of the Abdominal, or Pelvic, cavity, which body cannot be removed by those Muscular actions of which we are now speaking, Vomiting will, in all probability, be continually occuring. Thus, in diseased states of the Uterus; in prolapses of that organ; in disorder of the Alimentary canal, arising from the presence of an immoveable substance, or from increased Sensibility of its Nerves, or from Inflammation, or from contraction of the canal; in diseases of the Urinary organs, whether of the Kidney, of the Ureter, of the Bladder, of the Prostate gland, or of the Urethra; in cases where a Pessary is firmly fixed in the Vagina; in all these cases, those Muscular actions which are set on foot to dislodge the impressing substance, or, in other words, to get rid of the Sensation, but which fail to do so, may induce the act termed Retching.

There are many other cases, besides those which I have mentioned, in which those Muscular actions are induced, of whose contractions Retching is an effect. Thus, altered conditions of the Cranial Brain, produced by increased Compression of that substance; or by Concussion; or by diminished Compression, arising from the sudden diminution of the quantity of Blood that flows through the Cerebral blood-vessels; or by great expenditure of Nervous Power; or by intense pain; or by rapid whirling of the Head; or by swinging or sailing; or by the rapid succession of objects of sight; or by Passions; or by powerful exertion of the Faculties; may cause the production of those Muscular actions of which Vomiting is an effect. In these cases, it is probable, that the altered condition of the Cranial Brain either leads directly to those Muscular actions of which Retching is an effect; or that it produces an altered condition of the Nerves of the Stomach, in consequence of which, uneasy Sensations arise from impressions which, previously, did not cause uneasiness, to remove which impressions these Muscular actions are called forth; or that the altered condition of the Cranial Brain affects the quantity, or the quality, of the fluids which flow into the Stomach, in which case, those fluids may, by their action upon the Nerves of the Stomach, produce inconvenience, to remove which the act of Retching is instituted. It is probable that, in different cases, the altered state of the Cranial Brain may act in each of these different ways.

By whatever cause those Muscular actions are produced of which Retching is an effect, such actions will not only produce compression of the contents of the upper part of the Abdominal cavity, but they will also diminish the capacity of the Thorax. So that the act termed Retching may not only expel from the Stomach a part, or the whole, of its contents, but, as it will cause the sudden and forcible expulsion of air from the Lungs, which air may, in its passage, dislodge and eject any substance which is seated in the air-passages, it may also produce expectoration. Retching will also, by causing pressure to be made on the Heart, affect, more, or less, the action of that organ. Thus also we find, that, when Muscular actions are called forth to procure the removal of any substance from the air-passages, or from the Fauces, as those actions cause compression of the Stomach, they may also produce Vomiting. In like manner, we find, that the same Muscular actions which produce an evacuation of the Bladder, may also produce an evacuation of the Rectum, or of the Uterus; and that an effort to empty either of these two latter cavities, may cause the evacuation, of either of the two other cavities, or of both of them.

Vomiting, then, is merely an effect which results from the associated actions of several Muscles.

From what has been stated it appears, that Muscular actions which are set on foot to get rid of an uneasy Sensation, often fail to do so; and that, when they succeed in doing so, they often effect more than was intended.

An unattached substance, which produces an impression on the Nostrils, on the Fauces, on the Trachea, on the Bronchia, on the Œsophagus, on the Stomach, on the upper part of the Duodenum, on the Rectum, on the Bladder, or on the Uterus, may be, more or less readily, ejected from these several situations by the combined actions of Muscles, because, as the egress from these several cavities is short and easy, the impressing substance, when it is forcibly compressed by those Muscular actions, finds an exit by the outlet which is offered to it. But when an impression is made on the more central portion of the Alimentary canal, the substance which produces that impression is not so readily removed. The canal is very long, and very much convoluted, so that although the natural peristaltic motion of it be assisted by the strong contraction of powerful Muscles externally, yet these united actions may not succeed readily, if at all, in getting rid of an impressing substance. There are only two outlets by which such substance can be expelled, viz. by the Rectum, or by the Œsophagus.

It may happen, then, that the presence of a substance in the Intestines, although it be unattached, may yet keep up the repeated actions of Muscles for a considerable length of time. And when that substance is ultimately ejected, if a greater degree of impediment be offered to its passage towards the Rectum, than towards the Stomach, it may be forced into the latter cavity, whence it may be ejected by those combined Muscular actions which have already been spoken of as constituting the act of Retching. The passage of a substance along the Alimentary canal in a direction opposite to the usual course, or, in other words, the passage of it in a direction from the Intestines towards the Stomach, may, in the case under consideration, be assisted by the action of the canal itself; for, when the peristaltic motion of the canal is, for any length of time, opposed in its usual direction, it becomes, in many instances, inverted, so that it conveys the contents of the canal in a retrograde direction. Thus, Hernia, Intussusceptio, or any other obstructed state of the

Intestines, or a paralyzed, or over-distended, state of their Muscular fibres, in any part of their extent, may cause an inversion of the peristaltic motion, which, aided by the associated actions of Muscles situated externally to the canal, may cause an impressing substance to be conveyed from the Intestines into the Stomach, whence it may be ejected by the act of Retching.

It rarely happens that any one Muscle acts alone. Almost all the effects which result from Muscular action require the co-operation of several Muscles. Thus, if it be required to raise the hand to the head, several Muscles must be called into action to effect that movement. And, as the upper extremity is frequently moved about in a variety of directions, the several Muscles of that extremity very frequently act in concert. The same observations apply to the lower extremity. The Muscles which co-operate in producing various movements of the upper extremity are, those of the fore-arm, of the arm, of the Scapula, and of the Thorax.

The action, termed Respiration, requires the co-operation of several Muscles, and, as this action continues during life, those Muscles are continually associated in their actions. The Muscles which are engaged in performing the office of Respiration, are, principally, the Diaphragm, and the Muscles of the Thorax, assisted, more, or less, by those of the Abdomen, and by those of the Neck. So that these Muscles are continually acting in concert.

In producing the evacuation of the Bladder, and of the Rectum, the Muscles of Respiration act in concert with those of the Abdomen and of the Pelvis.

In keeping the Body erect, at the same time that it is moved onward, as during the act of walking, all the Muscles of the Neck, of the Trunk, and of the lower extremities, are kept in successive action.

So that from the complicated movements which are, continually, or periodically, accomplished by Muscular exertion, all the Muscles of the Body become, more or less, associated in their actions. For the Muscles of the upper extremity act in concert with each other, and they also act with the Muscles of the Neck, of the Thorax, and of the Scapula; the actions of these last sets of Muscles are associated with the actions of the Muscles of the Abdomen, and with the Diaphragm; and the actions of the

Abdominal Muscles are associated with those of the Pelvis and of the lower extremity.

Different Muscles, besides being thus connected from acting frequently in concert, are also connected with each other in three different ways. First, by receiving branches from the same Nerve; Secondly, by a connexion existing between their Nerves; and, thirdly, by receiving branches of vessels from the same Arterial trunk.

In consequence of the connexion that exists between the actions of different Muscles, it becomes a matter of difficulty, in many cases, when one Muscle is called into action, to prevent the action also of other Muscles of the same set, or that of distant Muscles whose actions have been frequently associated with those of the Muscle in question. Thus, a fiddler, when he moves the bow-arm, and the fingers of his left hand, can scarcely avoid moving also his foot, his head, and his mouth. If suffocation be threatened, as by compression of the Trachea, or by Spasmodic action of the Muscular fibres of the Larynx, arising from the inspiration of certain gases, or in any other way, the Muscles of Respiration are called into action, and, with these, are united the actions of the Muscles of the upper, and of the lower, extremities, and of almost all other parts of the Body, although these actions cannot assist in removing the cause of the uneasy Sensation. In like manner, if any other violent Sensation be referred to any other part, several Muscles will be thrown into action, although their contractions cannot have any effect in removing the impression from which the Sensation arises.

Thus too, it often happens, that if an effort be made to get rid of an impression which is made on the Alimentary-canal, not only will the Muscles of the Abdomen, and of the Pelvis, be called into action, but those also of the Thorax, of the Neck, of the Face, of the upper, and of the lower, extremities, may be also thrown into action, although the contractions of all these latter Muscles cannot assist in removing the impressing substance. The presence of depraved *ingesta*, for instance, or of Secreted fluids whose quality is unnatural, or of hardened fæces, or of unusual substances, or of worms, in the Intestines; or a diseased condition of the Mucous membrane lining that canal; or an increased degree of the Sensibility of the canal; or an inflamed, or an abraded, or a distended, state of the canal; all these causes may severally give rise to Muscular actions, many of which cannot have any effect in procuring the removal of any impressing body from that canal.

So also, if an impressing substance be situated in other parts of the Abdominal cavity, as in the Biliary ducts, in the Kidnies, in the Ureters, or in the Uterus, Muscular actions may be called forth with a view to the removal of such impressing substance, and with those actions may be joined the actions of several other Muscles, whose contractions cannot have any effect in diminishing the capacity of the Abdominal cavity.

In short, as the only power of voluntary action which we possess, is exerted through the medium of Muscles, we readily call these agents into action, whenever we wish to use any exertion to rid ourselves of an impression which gives rise to an unpleasant Sensation. And in a highly sensitive, and irritable, state of the Nervous System, or when the Mind is little capable of reasoning on its operations, or when it scarcely takes time to do so, a confused, hurried, and general, contraction of Muscles is produced by the presence of a keen Sensation, although such contraction may not have any effect in removing the Sensation, or, in other words, of getting rid of the impressing body. If a person be in extreme pain, his Body is kept in continual agitation by Muscular actions, yet these actions cannot remove the cause of his Sensation. If a child have a keen Sensation from the distension produced in the Gum by a protruding tooth, general contraction of its Muscles may take place, which may cease instantly if that distension be removed by the division of the Gum. If the current of the Blood be impeded in any part of the round of the circulation, an effort is, in many cases, made to remove the obstruction, and, as voluntary exertion can only be put in force through the medium of Muscular action, that action will be set on foot, although it can scarcely produce any effect in procuring a more free passage of the circulating fluid. Thus, when there is Congestion in the large Venous trunks; when a person is recovering from Syncope; when, as in what are termed Eruptive diseases, an effort is made to give freedom to the circulation, as just before the appearance of the Eruption, or on its sudden retrocession; or in other cases; Muscular actions, are in many instances, set on foot, although they are productive of little, if of any, advantage.

But these are far from being the only cases in which inordinate, or unusual, actions of Muscles may arise, for such actions may occur in the absence of all those causes which have been enumerated,

The contraction of a Muscle is produced by the transmission of Nervous Power to its fibres from Cerebral substance, as from Cranial, or Spinal, Brain; this transmission is accomplished through the medium of Nerves, along which we conceive the Nervous power to be conveyed, in a direction from their Cerebral, to their anti-cerebral extremities, Whatever, then, causes the transmission of this Power to Muscles, will produce contractions, of their fibres; and by whatever Nerve this Power is conveyed, contraction will take place in all those Muscular fibres among which the anti-cerebral terminations of that Nerve are distributed,

Certain impressions on the Cranial Brain, and certain conditions of that substance, cause the Nervous Power to be transmitted to the several Muscles of the Body, without the exertion of the Will of the individual, and, perhaps, without any consciousness on his part. Thus, increased Compression of the Cranial Brain, whether produced by simple Plethora, or by Congestion,, or by Tumours, or by Abscesses, or by effusion of Blood, or of watery fluid, within the Cranium, or by Erostosis, or Spicula of the inner table of the Cranium, or by indentation of that bony structure; Inflammation of the Cranial Brain; Erethism of that substance; Torpor of the Cranial Brain, whether it be the consequence of previous Erethism, or arise from Concussion, or from increased Compression, of the Cerebral substance, or from Intoxication, or from loss of Blood, or from great expenditure of Nervous Power, or from the action of Sedatives, or of other Poisons, (whether acting through the medium of Nerves, or by their being admitted into the Blood), or from the inspiration of certain gases, or from violent Passions, or from powerful exertion of the Faculties; these, and several other undefinable states of the Cranial Brain, may give rise to inordinate and involuntary actions of all the Muscles of the Body, or of a principal part of them.

Similar conditions of the Spinal Brain, may induce involuntary action in all those Muscles, the Cerebral extremities of whose Nerves terminate in that Brain, either at, or below, the part whose condition is altered from the natural state. But as an altered condition of a portion of the Spinal Brain, may affect the state of every part of that substance, and may alter the condition of the Cranial Brain, so may such altered condition of the Spinal Brain, produce inordinate and involuntary actions throughout all parts of the Muscular System.

Certain impressions upon a Nerve, may give rise to contraction of those Muscular fibres, among which the anti-cerebral terminations of that nerve are distributed. Thus, the pressure of a sharp body on a Nerve, Stimulants applied to a Nerve, the partial division of a Nerve, may severally produce involuntary action in all those Muscular fibres, which receive the anti-cerebral terminations of that Nerve.

Impressions which are made on one extremity of a Nervous cord, may produce involuntary action in Muscular fibres, which are situated at the opposite extremity of that cord. Thus, an impression on the ducts of the Liver, may give rise to involuntary action of the Muscles of the Neck.

If the Sensibility of a Nerve be increased, impressions, which, when made upon that Nerve in its natural state, did not give rise to contraction of the Muscular fibres among which its anti-cerebral extremities are distributed, may, if they be repeated, during the more sensible state of that Nerve, produce contraction of those fibres. Thus, in that state of the Nerves of the Face which is termed Neuralgia, (during the existence of which, painful Sensation arises from impressions which usually fail to produce Sensation,) involuntary action takes place in the Muscles of the Face. And thus, when the leg or the foot is affected by Gout, or by Rheumatism, involuntary action may take place in the Muscles of the lower extremity.

The increased production, or a diminished expenditure, of Nervous Power, may lead to the involuntary distribution of that Power to Muscles, in consequence of which, contraction of those fibres will be induced.

As the transmission of Nervous Power to Muscles is, in a majority of instances, and under common circumstances, regulated by the direction of the Intellect, whatever affects the condition of the Intellect, may affect also the transmission of Nervous Power, and, consequently, may affect the actions of Muscles. Thus, the production of Passions, leads, in many instances, to the production of Muscular actions. It has been already stated, that the presence of Sensation, may induce the action of Muscles. The presence of Re-Sensation, or of Revived Sensation, may cause the re-production of Muscular actions, which attended either the original production of such Sensation, or former revivals of it.

All the Muscular actions which I have been speaking of, consist of the alternate contraction and relaxation of Muscular fibres, the contraction being produced by the agency of Nervous Power. These contractions of Muscular fibres must not be confounded with those permanent contractions which take place in Muscular fibres, whose actions have been long kept up, or whose Antagonists have been weakened, or paralyzed; for, in these latter cases, the contraction which occurs, is the effect of a tendency which is inherent in the Muscular fibre, and which is, to a greater, or less, degree, exerted by the fibres of every Muscle, even during their, apparently, quiescent state. This tendency is called the Tone of the Muscular fibre.

From what I have stated, it appears, that inordinate, or unusual, or involuntary, actions of Muscles, accompany an infinite variety of altered states of the several parts and functions of the œconomy. But, in none of the instances which I have enumerated, do those Muscular actions constitute disease, they being merely the effect of an altered condition of some part of the œconomy.

In some cases, however, when the associated actions of several Muscles have been kept up for a considerable length of time, by the frequent repetition, or by the long-continued presence of an impression, or when they have been called forth by some powerful Passion; as by Fear, such actions may continue, either after the impressing body has been permanently removed, or after the impression has entirely ceased, or when such Passion has subsided. Or these Muscles may have become so connected in their actions, that whatever causes the action of one of them, may induce also the action of all the rest.

Certain Passions are usually accompanied by corresponding movements of Muscles, Dancing, and Leaping, for instance, may be called forth by excessive Joy.

Independently of all the cases of increased Muscular action which have been enumerated, I may observe, that Muscular action may be more freely, and more extensively, performed, in consequence of an increase, within certain limits, of the general mass of the Blood, or owing to an improved state of that fluid, or from increased rapidity of its circulation. It may be also increased in consequence of a general increase of the Sensibility of the Nervous System; or from the presence of an increased quantity of Nervous Power; or from increased temperature; or from an increase (within certain limits) of the Tone of the Muscular fibres.

Muscular action may be lessened by causes, the reverse of those which produce an increase of that action. Any interruption between the Cerebral and the anti-cerebral extremities of Nerves belonging to Muscular fibres, will lessen, or suspend, the action of those fibres. Or if those Nerves are, by any means, rendered unfit conductors of the Nervous Power, that action will be diminished, or suspended. Whatever engrosses the attention of the Intellect, whether Sensations, Passions, or the exercise of Faculties, may, by with-drawing it from the direction of the Nervous Power to Muscles, act as an indirect cause of diminished action of Muscles.

Intellect.

THE presence of Sensation, implies the existence of a corresponding state of a part of the Nervous System. As an impression, then, which gives rise to Sensation, must produce a change in the state of some part of the Nervous System, so may such change, when produced, not only give rise to Sensation, but it may alter the performance of the functions of that System, and it may, in other ways, affect the condition of the whole œconomy. In such cases, Sensation has no part in the production of these changes in the œconomy, but it is merely a concomitant effect, resulting from the operation of the same cause.

The production of a high degree of Sensation, may produce general Insensibility of the Nervous System, during which state, the functions of that System will be suspended, the action of the Heart, and Muscular action generally, may also be suspended, the production of Nervous Power and of Heat may cease, Sensation may be absent, and all the functions of the Intellect may be suspended. Thus, violent pain produces Syncope.

Violent pain, when it does not produce Syncope, may quicken the action of the Heart, and may cause an increase of Exhalation, and of Temperature. The long-continued production of Sensation induces that state of the Cranial Brain during which Sleep occurs. We have already seen that Sensation leads to the production of Muscular action. It leads also to the production of Passions; to exercise of the Faculties; and to the production of Revived Sensation, from the presence of which may result, all those effects which attended, or followed, the original production of that Sensation so revived, or which have attended former revivals of it.

If a high degree of Sensation be present, the Mind may be so engrossed by it, as to disregard all other effects of impressions; the Mind, in such a case, may cease to direct Muscular actions, excepting such actions as may be connected with that Sensation, or with some Passion which that Sensation calls forth. When, for instance, a Man is entirely occupied in attending to Musical sounds, he neither sees, nor smells, nor tastes, nor has any other Sensation present, excepting that which arises from the impression upon his Auditory Nerves; although his Retinæ may be impressed by Light, his Nostrils by odoriferous particles, his Palate by sapid food, and other parts of his Body by other substances. He has no Passion present, excepting such as is connected with the sounds, or with the Musician; Joy, or Grief, may be excited by the former, in which case, Revived Sensations will be associated with the present Sensation; or Love, or Envy, may be excited with a reference to the latter. His respiration may be, more, or less, interrupted, or suspended; but he may perform with eagerness other Muscular actions, which are connected with the Sensation, or with the Passion, such as Dancing, clapping of hands, and the like.

If any Passion be present, in a high degree, the Faculties may be dormant, and all effects of impressions may be disregarded, excepting such as are connected with that Passion. Passions may affect the action of the Heart; thus Joy, Pride, Desire, Fear, Anger, and Rage, increase that action; Grief, on the contrary, lessens it, Shame increases the capacity of the blood-vessels of the Face, while Fear diminishes it. Joy, Grief, Shame, and Rage, may increase the secretion of Tears. Grief increases the secretion of Urine. Anger may increase the production of Bile. Parental fondness may increase the secretion of Milk, while dislike of the infant may lessen that secretion. Fear increases

Exhalation from the surface of the Body. Grief lessens the appetite for food, and impairs Digestion. The presence of Passion may prevent attention being paid to the calls of Hunger. Fear and Surprise quicken the action of the Alimentary canal. Grief diminishes that action. Respiration is quickened by Love, Desire, Shame, Fear, and Joy; it is partially suspended by Rage; it is rendered slow by Grief. Joy and Rage increase the production of Nervous Power; Grief lessens the production of it. The Temperature is increased by Joy, Love, Fear, and Shame; it is diminished by Grief. Muscular action is called forth powerfully by certain Passions, as by Joy and Rage: it is not much exerted during the presence of Shame, or of profound Grief. The presence of a Passion may lead to the revival of Sensations which have formerly been associated with similar Passions, and such revival may lead to other Passions, or to exercises of the Faculties.

If any Faculty be powerfully exerted, no Passion may be present, nor may the effects of impressions be regarded. Or such Passions only may be present, or such Sensations only may be attended to, as are, directly, or indirectly, connected with that subject on which the Faculties are employed. The exercise of the Faculties leads to the production of Passions; or it subdues, and alters the character of, Passions; and it leads to the production of Revived Sensation, and of Re-Sensation.* The powerful exercise of the Faculties affects, in a very great degree, the condition of the Cranial Brain.

Sensation may be more freely produced by impressions, in consequence of increased Sensibility of the Nervous System generally; it will be more copiously produced also, in consequence of the absence of Passion, and from a quiescent state of the Faculties.

Sensation may be less copiously, or less powerfully, produced, in consequence of diminished Sensibility of the Nervous System in general; or owing to increased thickness, or altered condition, of the medium interposed between the Nerve and the impressing body; or owing to a less perfect, and less ready, communication between the Nerves and Cerebral substance; or from the presence of powerful Passions; or from an active state of the Faculties.

The production of what I have termed* Revived Sensation, and Re-Sensation, is dependent upon the state of the Nervous System generally; it is influenced by the production of Sensation, by the state of the Passions, and by the exercise of the Faculties.

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* See "Sketch of the Œconomy of Man." London. 1819. Article *Sensation.*

The production of Passion is dependent upon the production of Sensation, of Revived Sensation, and of Re-Sensation, as well as upon the exercise of the Faculties. It is dependent upon the state of the Cranial, and Spinal, Brains; upon the degree of expenditure of the Nervous Power; upon the quantity, and quality, of the Blood; upon the process of Secretion in different Secreting structures; upon the state of the Alimentary canal; upon the condition of the several Viscera; upon Muscular action; and upon the Temperature of the Body.

The exercise of the Faculties is dependent upon the condition of the Cranial Brain; it is influenced by the presence of Passions, by Sensation, by Revived Sensation, and by Re-Sensation.

General Inferences.

FROM the preceding investigation it appears:

That the state of the System of Supply and Waste is dependent, upon the condition of its several parts; upon the state of the Nervous System; upon the state of the Nervous Power, and of the Temperature; upon the state of the Muscular System; and upon the state of the Intellect.

That the state of the Nervous System is dependent, upon the condition of its several parts; upon the state of the System of Supply and Waste; upon the state of the Nervous Power, and of the Temperature; upon the state of the Muscular System; and upon the state of the Intellect.

That the production, and the expenditure, of Nervous Power, are dependent, upon the state of the System of Supply and Waste; upon the state of the Nervous System; upon the state of the Temperature; upon the state of the Muscular System; and upon the state of the Intellect.

That the Temperature is dependent, upon the state of the System of Supply and Waste; upon the state of the Nervous System; upon the state of the Nervous Power; upon the state of the Muscular System; and upon the state of the Intellect.

That the state of the Muscular System is dependent, upon the state of the System of Supply and Waste; upon the state of the Nervous System; upon the state of the Nervous Power, and of the Temperature; and upon the state of the Intellect.

That the state of the Intellect is dependent, upon the state of the System of Supply and Waste; upon the state of the Nervous System; upon the state of the Nervous Power, and of the Temperature; and upon the state of the Muscular System.

Consequently:

That every part of Living Man, and every function of every part, affects, and is affected by, the state of every other part, and of every other function. So that, whatever affects the condition of any one part, or the performance of any one function, may affect the condition of every other part, and the performance of every other function.

There is a certain state of the several parts of the œconomy; a certain state of the several functions of each part; a certain mutual relation, and balance, and exchange of influence, between all these several parts, and functions; which constitute that condition of Living Man to which the term *Health* is applied.

The term Disease embraces every state of the œconomy, which is different from that condition which is termed Health.

Although, in consequence of the intimate relation and connexion which subsist between all parts of the œconomy, an alteration occurring in the state of any one part, or in one particular function, involves every other part and function in disorder, still a preponderance of disorder may obtain in one particular part, or in one particular function, giving to Disease a peculiar shade or character. Hence it is, that the features of Disease vary so much in different cases, and are so susceptible of change; and that the forms which Disease assumes may be infinitely diversified.

It follows, then, that it is impossible to portray the various forms under which Disease may appear.

If we were to endeavour to affix a distinctive character to different cases of Disease, by enumerating the several causes from which Disease may arise, we should find ourselves baffled in the attempt, since similar causes may lead to a variety of different effects, and similar effects may result from the operation of very different causes.

Foiled, thus, in our attempts to mark the varied tints of Disease, if we would content ourselves with enumerating, *seriatim*, every Symptom by which the presence of Disease has ever been indicated, our labour would still be unprofitable. For, since similar Symptoms may arise from very different causes, and may accompany very different gradations, or modifications, of Disease, the enumeration of solitary Symptoms could not answer any purpose; it would be merely a statement of effects, the causes of which were unassigned. And as it rarely happens, that any one Symptom presents itself alone, (each Symptom being, in different cases of Disease, connected and complicated with a variety of other Symptoms to an infinite extent,) and as no one Symptom, or assemblage of Symptoms, is found to accompany, invariably, any one form of Disease, it follows, that it is impossible so to construct a list of diseased states, that any one Symptom, or any assemblage of Symptoms, shall invariably indicate the existence of a distinct and definable form of Disease,

In short, we find, that, as far as regards the production of a deviation from the Healthy state in the several parts and functions of the Œconomy, causes are effects, and effects operate as causes. It is scarcely possible to mark accurately where the circle of disordered actions commences, or where it terminates. For, when once the balance of Health is disturbed, when the due relation between the several parts and functions, is once destroyed, every part is thrown into confusion, and every function becomes disordered. And as the disturbance of any one part, or function, involves every other part and function in disorder, so will the disturbance of the œconomy be more and more increased, until all traces of the natural condition of it are lost.

Not only may the presence of similar deviations from the Healthy state in any part or function, produce different symptoms in different individuals, but it may give rise to a varied succession of symptoms in the same individual; so that, if our judgments are controuled by an attachment to Nosological System, we shall be induced to suppose that the Disease of our patient is perpetually varying, whereas, in fact, the effects vary, while the cause remains the same. Thus, we are constantly hearing of the *Conversion of Disease*, a term which merely implies that a new assemblage of Symptoms has appeared.

If we refer to the histories of Diseased states of the Œconomy, as sketched with a view to the Classification of these states, and if we examine the various Classifications which have been formed from these histories, we shall see that every Nosologist has felt the difficulty, nay the impossibility, of collecting every possible form of Disease, and of arranging those which he has been induced to describe.

There are two ways in which the Bodily structure of Man may be described. We may speak of it as being composed of distinct sets of structures, as of those which are comprized under the terms, Vascular System, and its appendages, Nervous System, Muscular System, and Basal structure, which latter term comprehends the Bones, the ligaments, and the variaties of membrane; or we may treat of it, after the manner of Geographers, as consisting of the Head, of the Neck, of the Thorax, of the Abdomen, and of the upper, and lower, extremities; subdividing each of these parts, and enumerating the several contents of each. An equal degree of mischief may result from each of these modes of considering our structure. For, whichsoever mode we adopt, we acquire a habit of considering each portion which we enumerate, as a distinct, and insulated, part. The consequence is, that when any deviation from the Healthy state occurs in any one of the sub-divisions which we have made, our attention is fixed upon the diseased condition of this particular portion of the Body, while every other portion is supposed to preserve its former Healthy state.

Thus, those who have adopted the first mode of considering our Bodily structure, speak of Diseases of the Nervous System, Diseases of the Vascular System, and Diseases of the Muscular System. In so doing, they are incorrect, in as much as a disordered state of either of these Systems implies also a diseased condition of each of the other Systems.

Those, on the other hand, who adopt the latter mode of regarding our Bodily fabric, speak, of Diseases of the Head, of the Chest, of the Abdomen, of the Skin, &c. They subdivide these into Diseases of the Cranium, of the Cranial Brain, of the Lungs, of the Heart, of the Liver, of the Stomach, of the Bowels, of the Spleen, of the Pancreas, and so on. These persons act incorrectly also, because, in as much as, in each part which they enumerate, there are portions of the general Nervous System, and of the general Vascular System, it is evident, that each part cannot be considered as a distinct, insulated, republic, but as a constituent portion of the general commonwealth, whose Health is dependent upon a certain condition of every portion of the Body.

As the several animated beings of our globe, have been reduced into Classes, Orders, Genera, and Species, in which they have had their several places assigned to them, from some leading characteristic in their form, their habitation, or their œconomy, so has an attempt been made to form a similar arrangement of Diseased states.

If we examine the different arrangements which have been framed by Nosologists, we shall find, that each class, and, indeed, each sub-division of each class, is, for the most part, founded upon some leading Symptom, or upon the preponderance of the deviation from the Healthy state, occurring in one particular part, or in one particular function. Since, then, such symptom, or such preponderating deviation, may, as we have seen, be the result of an altered condition of any part, or function, of the œconomy, it follows, that no one of such Classes, nor any one of the sub-divisions of either Class, can comprehend the result of any peculiar primary deviation from the Healthy state. For the same primary deviation from the Healthy state may induce conditions of the œconomy, which are comprehended under each of the Classes, and, probably, under each of the sub-divisions of each Class. In other words, Diseased states which are arranged under a variety of distinct heads, may, alike, be the consequence of the same primary deviation from the Healthy state. And, on the other hand, each Diseased state contained in each Class, may, alike, arise from an altered condition of any one part, or of any one function, in the œconomy.

The titles which are bestowed upon Diseased states, are, either Arbitrary; or they have a reference to some cause which may give rise to such state; or they are descriptive of some particular appearance of the Body; or of some principal symptom; or they denote some part of the œconomy, in which the deviation from the Healthy state is most perceptible.

If Disease assumed a certain fixed number of definable forms; if it had its seat in particular organs, or portions, of the Body; if it arose from certain assignable causes; then might we easily construct a Nomenclature of Diseased states, with a reference to those forms, to those seats, or to those causes. But, as the forms of Disease may be infinitely varied; as its effects extend, in a greater, or less, degree, to every organ, and to every portion, of the Body; as the causes of it are innumerable and unassignable; it follows, that no list of titles, however extensive, can be applicable to, or can comprehend, the several cases of Disease which may present themselves.

It follows, then, that, in all Classifications of Diseased states, there must be much error and confusion, and that they must all be constructed on false principles. Let us take, for example, the arrangement adopted by Cullen. His Classes are entitled, *Pyrexiæ, Neuroses, Cachexiæ, Locales.* The first title, indicates increased Heat; the second, disorder of the Nervous System; the third, a depraved condition of the œconomy; the fourth, Local affections. Now an increase of Heat is one effect, which may result from various alterations occurring in every part, and function, of the œconomy. Disorder of the Nervous System makes a part of every Diseased state that occurs. A depraved condition of the œconomy is synonymous with Disease. And, strictly speaking, no Disease is Local. So that this Classification is arbitrary, and incorrect, and this application of terms is calculated to lead us into error.

If we descend to the Orders, and to the Genera which they contain, we shall find the same error prevailing throughout the whole of them. We read, for instance, of Dropsical diseases; and of Spasmodic diseases. But Dropsy is not a Disease, it is merely a consequence of various deviations from the Healthy state. Nor do the inordinate Muscular actions, which accompany several forms of Disease, constitute Disease, they are, simply, the effects of various altered conditions of the œconomy.

Every reflecting person, will, I presume, give his assent to the truth of these observations. Yet if we refer to the manner in which Pathology is taught in the schools, is treated of in books, and is considered in practice, we shall find that this truth is perpetually lost sight of. A Nomenclature is adopted, which is, necessarily, erroneous, and which the nature of Disease does not admit of; effects are dignified with titles, each of which is considered as descriptive of a distinct form of Disease; and rules are laid down, and are acted upon, for the treatment of effects, which should not claim any part of our attention, except in as much as they may throw light on the several causes from which they may result.

As we cannot, then, describe, under any titles, all the varieties of form under which Disease may appear, it is evident that we cannot possess any fixed and definite rules for the recovery of Health. If, indeed, Disease appeared under a limited number of forms, each of which could be distinctly defined; and if certain fixed rules could be laid down for the treatment of each form, then would Pathology be comprised within a small compass, and Medicine would no longer be a science.

But Pathology is a wide, and extensive, field, presenting the most ample scope for observation and inquiry. It happens, unfortunately, that the landmarks which have been set up to direct our course, too often lead us into error, Wide, then, as is the field of Pathology, it is better that we should be left to rove at large over it, with no other guides than our observation and our reason, rather than that we should be furnished with false guides which will mislead us.

In proportion as we are attached to any particular Nosological arrangement, are we in danger of being misled by it. It will, inevitably, lead to erroneous conclusions, in theory, and in practice. Few persons are aware of the powerful efforts of reason and reflection that are required, to overcome the prejudices which silently steal over our Minds from the adoption of any System of Nosology. They are prejudices which obscure our view, which oppose conviction, and which fetter and controul our practice. We are too apt to consider the term Disease as designating a hostile invader of the œconomy, whom we must dislodge, or defeat; and we, insensibly, learn to regard every title, which we meet with in our catalogue of Diseased states, as denoting a distinct personification of Disease, as implying a definable Unity, peculiar and individual in its kind, the presence of it being manifested by certain peculiar Symptoms.

Whenever, then, a case of Disease presents itself, instead of resting satisfied with marking the disturbances in the œconomy, with tracing these to their several sources, and with devising the most probable means for allaying them; our first and chief care, too frequently, consists, in determining upon a fit appellation for the form of Disease before us. Possessing as we do a catalogue of names, each of which has been assigned to a certain assemblage of the effects of disease; custom, enforced by the wishes of the patient and of his friends, and by a value for our own reputation, requires that one of those names be applied to this particular case. The consequence, too often, is, that with the best intentions, we take a partial, and a prejudiced, view of the case; we magnify, and dwell upon, certain symptoms; we pass over, or disregard, other symptoms; we refer to our Nosological chart, and we select the title which is there affixed to an assemblage of a majority of those symptoms which we have discovered in the instance before us, and we apply that title to this particular case which we are considering. No sooner have we selected a name, that seems better adapted than its fellows to the Diseased state of our patient, than we suspend our inquiries, and we rest satisfied with having fulfilled the first part of our duty.

Having once determined upon the name of the Disease before us, the mode of treatment follows, in many instances, of course; for it is dictated by that name; there being a set of rules laid down for the treatment of each personification of Disease contained in the Nosological table. We employ the remedies which are enforced by those rules; if one of them fail, we have recourse to another; and, thus, we apply them in succession, until, perchance, the balance of Health is restored, or until we have tried all the remedies in vain. If, happily, the patient recover his Health, we consider that he is indebted to our art for his restoration; if the Diseased state continue, in spite of the enforcement of the rules laid down, we pronounce the case to be peculiarly obstinate, or, perhaps, incurable; but if, abandoning those rules, we apply other remedies under which the Healthy balance is restored, our humanity, and our vanity, are gratified by the notion, that we have made an important discovery in our art.

Thus, it happens, that, in many instances, remedies are applied blindly, and at random, the Diseased state continues, our art is reproached, and our patients are disappointed.

How then, it will be asked, are we to describe the various cases of Disease which present themselves, or how can we lay down rules for the treatment of any cases?

If we wish to describe any of the various forms under which Disease appears, we must content ourselves with enumerating the principal symptoms; with noting down the most striking deviations from the natural and Healthy condition of the several parts and functions; and with endeavouring to point out the most usual, and the most probable, causes of such deviations.

In laying down rules for the treatment of Diseased states, we can speak only in a general way. For, as the forms of Disease may be infinitely varied, so also must be the modes of practice. Whatever the form may be, we must recollect, that the presence of Disease implies a disturbance of that due relation, and harmony, and equilibrium, and exchange of influence, which ought to subsist between all the several parts of the œconomy. Our efforts must be directed towards the restoration of that relation and due equilibrium, for upon this depends the removal of Disease.

We must attend to every Symptom, carefully investigating the causes of each, and from a general review of all the symptoms, and of all their several causes, we must endeavour to detect the primary source of the general disturbance, of which the Symptoms are merely the sensible effects. The Symptoms will be our guides in this research, and, as soon as we have discovered the object of our investigation, those guides should be dismissed from our notice. For in vain shall we combat effects, if the cause remain unsubdued.

This is a point which cannot be too strongly impressed on the minds of practitioners. The attention of the patient is fixed upon the Symptoms; as these first excited his alarm, so do they continue, exclusively, to occupy his thoughts; for these he seeks a remedy, and to these he directs the notice of his attendants. And, if we examine the practice of Medical men generally, we shall find them too zealous in their application of remedies to particular Symptoms, which they suffer to divert their attention from what ought to constitute the main object of their research, namely, the discovery of the cause of those symptoms. Whoever candidly examines his own practice, must acknowledge the proneness of his mind to dwell on the more prominent symptoms of Disease, to the exclusion of all consideration of the general source of those Symptoms. We may, indeed, find it necessary to attempt to palliate the more troublesome Symptoms; but this must be a point of secondary importance, and it should not be allowed to interfere with the grand object, which we ought to keep steadily in view.

Should we, however, be unsuccessful in our endeavours to ascertain the cause of the general disturbance, or should this disturbance continue after the primary cause has been removed, or has ceased to operate, we must limit our efforts to the restoration of the natural equilibrium between the several parts and functions, and to the removal of the most prominent deviation from the Healthy state, which may exist in any part, or in any function.

With regard to the particular means, whereby we may reduce to a healthy state, any part or function in which a deviation from that state has occurred, we shall be guided in our selection of these, by a reference to the list of causes from which such deviation may arise.

APPENDIX.

APPENDIX.

No. 1.

Analysis of the Phænomena of Fever.

BEFORE we can attempt to explain the Phænomena of Fever, we must take a view of the leading symptoms by which the different stages of Fever are accompanied, and we must review the several causes from which these symptoms may arise.

Early Stage of Fever.

Symptoms.	*Probable Causes.*
A. General Muscular Debility.	1 Diminished Sensibility of the Nerves of Muscles. 2 Deficiency of Nervous Power. 3 Diminished flow of Blood through the blood-vessels of Muscular fibres. 4 Diminished Tone of Muscular fibres. 1 From Torpor of the Cerebral structures; from 3; from a turgid state of the blood-vessels which are intermingled with Muscular fibres; or from diminished temperature. 2 From Torpor of the Cerebral structures. 3 From diminished action of the Heart; from a contracted state of the smaller Arteries; or from diminution of the general mass of the Blood. 4 From 1; from 3; or from diminished temperature.

*B. Pain in the Head.	Compression of the Cranial Brain. 1 From Plethora of the blood-vessels of the Cranial Brain. 2 —— Congestion in the ——————. 1 From increase of the general mass of the Blood ; from less than the due proportion of Blood being received by other blood-vessels, owing to increased contraction of those vessels. 2 From obstruction in any part of the round of the circulation, whether in the Aortic, or Pulmonic, circuit.
*C. Confusion, and weakness, of the Intellect.	Torpor of the Cranial Brain. from Plethora ; from Congestion ; from diminished temperature ; from diminished flow of Blood through the blood-vessels of the Cranial Brain ; from morbid conditions of the Alimentary canal; from altered states of the Blood which flows through the Cerebral blood-vessels ; *&c.* (see the article Cranial Brain in the preceding Elements.)
D. Imperfection of Sight, Smell, and Hearing.	Torpor of the Cranial Brain. (see the causes above.)

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* Frequently arises from Erethism, or from Inflammation, of the Cranial Brain ; but, as such states are accompanied by Increased Sensibility of the Nervous System, we must, if we admit Diminished Sensibility among the symptoms of the first Stage of Fever, exclude both Erethism and Inflammation from this stage.

* Confusion of the Intellect may arise from Erethism, or from Inflammation, of the Cranial Brain, but these states are excluded from this examination of the first stage of Fever, for the reason assigned in the Note to B.

Early Stage of Fever.

Symptoms.	*Probable Causes.*
E. General Insensibility.	1 Torpor of the Cerebral structures. (see causes of C.) 2 Diminished Sensibility of Nerves. 2 from 1; from diminished flow of Blood through the smaller blood-vessels; or from diminished temperature.
*F. Pain in the Back.	Compression of the Spinal Brain. 1 from Plethora of the blood-vessels of the Spinal Brain. 2 ——Congestion in the ——————————. for the causes of 1. and 2. see the causes of B. 1. 2.
G. Sighing, and Oppression at the Præcordia.	1 Impeded flow of Blood through the Pulmonic circuit. 2 Imperfect action of the Heart. 1 from 2; from imperfect action of the Respiratory Muscles (see A); from a turgid state of the large blood-vessels near the Heart, whether caused by contraction of the smaller Arteries, or by increase of the mass of Blood; or from an obstruction existing in any other part of the round of the circulation. 2 from 1, or from any of the causes which give rise to 1; from diminished Sensibility of the Nerves of the Heart, (see the causes of E); from diminution of the mass of the Blood; from diminished Tone of the muscular fibres of the Heart.

* Frequently arises from Erethism, or from Inflammation, of the Spinal Brain, but these states are excluded from the present analysis of the first stage of Fever, for the reason already assigned. See the Note to B.

H. Respiration hurried.	See the causes of G.
I. Uneasy Sensations, referred to the limbs.	1 The same as those of F. 2 Compression of the Nerves in the limbs. 2 from contraction of the fibres of Muscles, produced by a compressed state of the Spinal Brain (see causes of F); or from a turgid state of those blood-vessels which are deeply seated in the limbs.
*K. Anxiety and Restlessness.	The same as those of B. C. F. G. H. I.
L. General diminution of Secretion.	1 Diminished Sensibility of Nerves. 2 Diminished flow of Blood through the smaller Arteries. 1 see E. 2 see the causes of A. 3.
M. Loss of Appetite.	1 Defective, or depraved, Secretion of the fluids which flow into the Alimentary canal. 2 Disordered state of the Nerves of the Stomach. 3 Constipated state of the Alimentary canal. 1 and 2 may produce each other; they may arise from the causes of E. and of L. 3 see O.

* These may arise also from Erethism, and from Inflammation, of the Cerebral structures, but these states are excluded from the present view of the first stage of Fever, for the reason assigned in the Note to B.

Early Stage of Fever.

Symptoms.	*Probable Causes.*
N. Vomiting.	May result from the causes of B., of G., and of M.
O. Constipation.	May result from the causes of E., of L., of M., and from N.
P. Diminished Temperature.	1 Diminished flow of Blood through the smaller blood-vessels. 2 Diminished Sensibility of the Cerebral structures. 3 - - - - - Nerves. 4 2. and 3. united. 1 see the causes of A. 3. 2 } 3 } see the causes of B., of C., and of F. 4 }
Q. Shivering.	1 Obstructed state of any part of the round of the circulation, (see the causes of G.) 2 Altered conditions of the Cerebral structures, (see the causes of B., of C., and of F.)

R. Contracted state of the Skin.	1 Diminished temperature. 2 Contracted state of the small Arteries of the surface of the Body. 1 see the causes of P. 2 see the causes of A. 3.
S. Diminished Exhalation.	1 Coldness of the Surface. (see P.) 2 Contraction of the Skin. (see R.) 3 Contracted state of the smaller Arteries. 3. from 1. and 2.
T. Thirst.	1 Diminished Secretion of Saliva &c. (see L.) 2 Disordered state of the Stomach. (see M. N.)
U. Pulse weak, irregular.	May result from the causes of G., and from H.

Second Stage of Fever.

Symptoms.	*Probable Causes.*
AA. Increased Heat.	1 Plethora of the Cerebral structures. 2 Erethism ——————. 3 1. and 2. combined, constituting Inflammation. 4 Increased Sensibility of Nerves. 5 Increased flow of Blood through the smaller Arteries. 1 from 2.; from 5.; from increased action of the Heart. * 2 from 1.; from 4.; from 5.; from increased action of the Heart. * 4 from 1.; from 2.; from 5. 5 from 4.; from increased action of the Heart; or, possibly, from diminished contraction of the smaller Arteries.
BB. Increased redness of the skin.	Increased flow of Blood through the superficial blood-vessels; from increased action of the Heart; from increased Sensibility of Nerves; from increased Heat; or from diminished contraction of small Arteries.
CC. Increased Muscular vigour. } DD. Sensibility increased. }	See the causes of AA.

* May increased Sensibility of the Nervous System arise as a consequence of the preceding Insensibility? See subsequent remarks on the formation of the different Stages of Fever.

EE. Respiration more free.	1 Removal of the obstructed state of the circulation. 2 Increased action of the Respiratory Muscles. 1 See the causes of BB. 2 See the causes of CC.
FF. Frequent, strong,* Pulse.	1 Increased action of the Heart. 2 Removal of the obstructed state of the circulation. 1 from 2.; from increased Sensibility of the Nerves of the Heart, induced by any of the causes of AA. May increased action of the Heart ensue as a consequence of its previous state of diminished action? 2 from 1.; from EE., and its several causes.
GG. Delirium. Wakefulness.	1 Erethism of the Cranial Brain. 2 Plethora———————. 3 1. and 2. united, constituting Inflammation.
HH. Continued Restlessness.	1 Erethism of the Cerebral structures. 2 Plethora———————. 3 1. and 2. united, constituting Inflammation.
II. Continued diminution of Exhalation.	Increased evolution of Heat from the surfaces of the Body. (see AA.)

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* The hardness of the Pulse appears to arise from the contractile power of the Artery being powerfully, although ineffectually, exerted, in opposition to the increased Momentum of the Blood, which is the consequence of the increased action of the Heart.

Decline of Fever.

Symptoms.	*Probable Causes.*
AAA. General Debility.	Torpor of the Cerebral structures. as a consequence of previous high state of Sensibility; from continued wakefulness; from Plethora, or congestion, in the Cerebral blood-vessels; from collections of effused fluid within the Cranial, and Vertebral, cavities; from deficiency of Blood in the Cerebral blood-vessels; from altered states of that Blood; from a morbid state of the Alimentary canal, or of other viscera; or from powerful mental, or muscular, exertion.
BBB. Copious Exhalation.	1 Torpor of the Cerebral structures. (see AAA.) 2 Diminished evolution of Heat. (see AA.) 3 Enfeebled action of the Heart. 4 Relaxed state of the smaller Arteries. 3 from diminished Sensibility of the Nerves of the Heart (see 1.); and as a consequence of previous strong action, during the 2nd. stage. 4 As a consequence of powerful exertion of their contractile power in opposition to the momentum of the Blood, during the second stage.

CCC. Diminished Heat.	1 Torpor of the Cerebral structures. (see AAA.) 2 Diminished Sensibility of Nerves. 3 Copious Exhalation. (see BBB.) 2 a consequence of I.
DDD. Feeble, slow, Pulse.	1 Enfeebled action of the Heart. 2 Relaxed state of the smaller Arteries. 1 See the causes of BBB. 3. 2 ——————— I.

Many more symptoms might be enumerated, but those which have been examined are sufficient for the purposes of this investigation.

The several causes which have been enumerated as being likely to produce the Symptoms attendant on the first stage of Fever, may be divided into:

I. Those which occur in the Vascular System; and
II. ——————— Nervous ———.

I. Those which occur in the Vascular System, are :

1 Diminished action of the Heart.
2 Obstructed state of the circulation generally.
3 Contracted state of the smaller Arteries.
4 Increased quantity of the general mass of the Blood.
5 Diminished——————————————.

1 may lead to 2 and to 3.
2 ———— 1 ——— 3.
3 ———— 1 ——— 2.
4 ———— 1 ——— 2.
5 ———— 1 ——— 3.

1, 2, 3, 4, are states compatible with each other.
1, 2, 3, 5,——————————————.

II. Those which occur in the Nervous System, are :

1 Diminished Sensibility of the Cerebral structures,
2 —————————— Nerves.

3 1 and 2 combined.

2 may be the consequence of 1.

The altered states in the division I. may induce those which occur in the division II., and *vice versa*, thus:

I. 1. 2. 3. and II. 1. 2. 3. mutually produce each other.
I. 4. or 5. may produce II. 1. 2. 3.

It follows, then, that:

I. 1. 2. 3. 4. and II. 1. 2. 3. are states compatible with each other.
and that I. 1. 2. 3. 5. and ——————————————.

It appears, then, that the Symptoms which accompany the first stage of Fever, may arise from:

Diminished Sensibility of the Nerves, as also of the Cerebral structures; diminished action of the Heart; obstructed state of the circulation; contracted state of the small Arteries.

The causes which have been enumerated as giving rise to those Symptoms which attend the second stage of Fever, may be arranged also under two heads, viz:

I. Those which occur in the Vascular System; and
II. ——————————Nervous——.

I. Those which occur in the Vascular System, are:
1 Increased action of the Heart.
2 Increased flow of Blood through the small Arteries.
2 is the consequence of 1.
1 and 2. are, then, compatible with each other.

II. Those which occur in the Nervous System, are :
1 Increased Sensibility of the Cerebral structures,
2 ——————————Nerves.
3 1, and 2. united,
1. and 2. mutually produce each other.
1. and 2, are, then, compatible with each other.

The altered states in the division I., and those in the division II., may, mutually, produce each othe

All these states, then, are compatible with each other.

It appears, then, that the Symptoms which attend the second stage of Fever, may arise from:

Increased Sensibility of the Nerves, as also of the Cerebral structures ; increased action of the Heart ; increased flow of Blood through the small Arteries.

The causes which have been enumerated as giving rise to those Symptoms which accompany the last stage of Fever, may be divided into :

I. Those which occur in the Vascular System, and
II. ——————————Nervous———.

I. Those which occur in the Vascular System, are :
1 Enfeebled action of the Heart.
2 Relaxed state of the small Arteries.
1. and 2, are compatible with each other.

II. Those which occur in the Nervous System, are:
1 Diminished Sensibility of the Cerebral structures.
2 ———————— Nerves.
3 1. and 2. united.
2 may arise from 1.
1 and 2., then, are compatible with each other.
I. 1. & 2. are compatible with II. 1. 2. 3.

It appears, then, that the Symptoms which occur in the decline of Fever, may be the result of:

Diminished Sensibility of the Nervous System; enfeebled action of the Heart; and relaxed state of the small Arteries.

It appears, then, that the several states which give rise to the several Symptoms which accompany the progress of Fever, may be arranged, thus:

In the early Stage.	*At the height.*	*In the decline.*
Diminished Sensibility of the Nervous System.	Increased Sensibility of the Nervous System.	Diminished Sensibility of the Nervous System.
Diminished action of the Heart.	Increased action of the Heart.	Enfeebled action of the Heart.
Contracted state of the small Arteries.	Increased flow of Blood through the smaller Arteries; the opposition which is made by the exertion of the contractile power of these vessels, being overcome by the increased action of the Heart.	Relaxed state of the small Arteries.

The primary cause of Fever, may induce a contracted state of the small Arteries, whence may ensue an obstructed state of the circulation, and, consequently, diminished action of the Heart, and a Plethoric, or Congested, state of the Cerebral blood-vessels, whence will arise diminished Sensibility of the Nervous System generally,

Or, the primary cause of Fever, may induce diminished action of the Heart, whence will arise diminished Momentum of the Blood, and, consequently, increased contraction of the small Arteries, and congestion in the Cerebral blood-vessels, which will give rise to diminished Sensibility of the Nervous System generally.

Or, the primary cause of Fever, may induce diminished Sensibility of the Cerebral structures, and, consequently, of the Nerves also, whence may arise, increased contraction of the small Artéries ; both which effects may induce diminished action of the Heart.

The three states, then, which produce the Symptoms of the early stage of Fever, may occur in either of the three following orders, viz :

1. Contraction of small Arteries.—Diminished action of the Heart.—Torpor of the Nervous System,

2. Diminished action of the Heart.—Torpor of the Nervous System.—Contraction of small Arteries.

3. Torpor of the Nervous System.—Contraction of small Arteries.—Diminished action of the Heart.

These three states having existed an uncertain time, a new order of states arises. The action of the Heart becomes increased, increased Sensibility of the Nervous System takes place, and an increased quantity of Blood is received by the small Arteries. These three changes may take place in varied order ; for instance :

The increased action of the Heart may first arise ; this may produce a removal of the Torpor of the Nervous System, and it may, by increasing the Momentum of the Blood, overcome the resistance, which is offered by the exertion of the contractile power of the small Arteries, to that fluid.

Or, the Sensibility of the Nervous System may become increased ; and to this altered state of that System may succeed, increased action of the Heart, and a more copious flow of Blood through the small Arteries.

Or, if the contracted state of the small Arteries give way, a more free and powerful action of the Heart may follow, and the Torpor of the Nervous System may be removed.

The state which produce the Symptoms of the second stage of Fever, may, then, occur in either of the three following orders, viz:

1. Increased action of the Heart.—Increased flow through small Arteries.—Increased Sensibility of Nervous System.

2. Increased Sensibility of Nervous System.—Increased action of Heart.—Increased flow through small Arteries.

3. Diminished contraction of small Arteries.—Increased action of Heart.—Increased Sensibility of Nervous System.

Having arrived thus far in our inquiry, let us return to the states which produce the Symptoms of the first stage of Fever.

Let us suppose a case in which *increased contraction of the small Arteries*, is the first effect of the primary cause of Fever.

In such a case, the resistance offered by those Arteries to the current of the Blood, may induce an obstructed state of the general round of the circulation, whence will ensue, a turgid condition of the larger Arterial, and Venous, trunks, and of the cavities of the Heart, and, from these effects, will arise, an oppressed, and an over-powered, state of the action of the Heart. The obstructed state of the circulation will lead to a turgid state of the Cerebral blood-vessels, which effect, as well as the want of a free supply, by those vessels, of Blood which has duly undergone the Pulmonic process, will induce Torpor of the Cerebral structures. And, from the Torpid state of those structures, as well as from the diminution of the quantity of Blood received by the small Arteries, will ensue, diminished Sensibility of the Nerves in general.

Thus will the several causes of the symptoms of the early stage of Fever, be present.

The action of the Heart, at first over-powered by the resistance offered to the Blood by the small Arteries, and still more enfeebled in consequence of the diminished Sensibility of the Nervous System, may gradually become increased. It may become increased, possibly, from its own powers of contraction having acquired an accumulation of energy during its oppressed state *, or in consequence of increased Sensibility of the Nervous System, or, perhaps, in some instances, owing to a diminution of the contraction of the small Arteries, and a consequent diminution of opposition to the action of the Heart. Should the action of the Heart become increased, the Momentum of the Blood will be increased, and, consequently, the resistance offered by the small Arteries may be borne down, in which case, the freedom of the circulation will be restored. The removal of the obstructed state of the circulation, and the distribution of an increased quantity of Blood throughout the Nervous System in general, will remove the causes of Torpor of that System. Torpor of the Cranial Brain, is, in many instances, succeeded by a degree of Sensibility of that structure, greater even than that which immediately preceeded the Insensible state of it. This is constantly, the case after Sleep. So also, an Insensible state of the Nerves in general, is, in many instances, succeeded by a degree of Sensibility, greater than that which immediately preceded the Insensible state. In the case under

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* As the fibres of a Muscle which has become enfeebled, from powerful exertion, or from great distension, or which has been, for a long time, inactive, acquire a state of increased contraction.

consideration, then, it may happen, that the Torpor, which prevailed in the early stage of Fever, may, after it has existed for some time, gradually be resolved into a state of increased Sensibility. The presence of increased Sensibility of the Nervous System, will be followed by increased action of the Heart, and by the flow of an increased quantity of Blood through the small Arteries.

Thus, may those states be formed, which give rise to the Symptoms attendant on the Second stage of Fever.

Suppose that Torpor of the Cerebral structures is the first effect of the primary cause of Fever. Such a state will give to general Insensibility. The action of the Heart will be diminished, and the contraction of the small Arteries will be increased. The increased contraction of these Arteries will, as we have seen, tend to produce an enfeebled action of the Heart; and a diminution of the action of the Heart leads, as we have also seen, to increased contraction of the small Arteries. Thus, may the causes of those Symptoms, which attend the early stage of Fever, be present.

If the Torpor of the Cerebral structures, after it has existed for an uncertain time, subsides, and is succeeded by a degree of Sensibility even greater in degree than that which preceded it, such new condition of the Cerebral structures will be attended by increased Sensibility throughout the Nervous System generally; increased action of the Heart will succeed, and an increased quantity of Blood will flow through the small arteries. Thus, those states will be established, which give rise to the symptoms attendant on the second stage of Fever.

If diminished action of the Heart be the first effect of the cause of Fever, diminution of the Momentum of the Blood will ensue, to which will succeed, increased contraction of the small Arteries, and Torpor of the Cerebral structures, and, consequently, a general diminution of the Sensibility of the Nervous System. And, thus, those states will be formed, which produce the symptoms of the early stage of Fever.

When these states have existed an uncertain time, if, as we have supposed, the Heart be enabled, from changes which take place within itself during its state of inactivity, to act with a degree of force even greater than before, the Momentum of the Blood will be increased, and the resistence of the smaller Arteries will be overcome. The Torpor of the Cerebral structures will be removed, and a præternatural degree of Sensibility of those structures may arise, not only as a consequence of an increased flow of Blood through their blood-vessels, but; possibly, as we have supposed, as a consequence of the previous state of Torpor. The increased Sensibility of the Cerebral structures will induce a general increase of Sensibility throughout the Nervous System, and will cause the action of the Heart to be still more forcibly exerted. Thus, in various ways, those several states which characterize the second stage of Fever will be established.

During the existence of the second stage of Fever, although an increased quantity of Blood flows through the small Arteries, yet this increased flow appears to arise, in the generality of cases, not from cessation, or diminution, of contraction, in those vessels, but from the increased action of the Heart enabling the Blood to force its way, into, and through, these Arteries, in spite of the opposition, which is offered by their contractile power, to that fluid. So that, in the second stage of Fever, there is, as it were, a continued contest, and struggle, between the action of the Heart, and the contractile power of the small Arteries, the balance of power being constantly in favour of the former.

We now proceed to the consideration of the last stage, or the decline of Fever.

We observe, that, whenever a high degree of Sensibility of the Nervous System, has existed for some time, it is, sooner, or later, succeeded by a state of Torpor, the degree of which is proportionate to the duration, and the degree, of the preceding Sensibility.

We also find that, when a high degree of action has been kept up, for some time, by the Heart, a languid action of that organ, sooner, or later, succeeds; the degree of languor being proportionate to the duration, and the degree, of the preceding strength of action.

When a high degree of resistance to the Momentum of the Blood, has been offered, for a length of time, by the contractile power of the small arteries, the exertion of that power will, sooner, or later, become enfeebled, or it will be suspended; the diminution of that exertion, being proportionate to the degree, and duration, of its previous activity.

We have traced the various ways, in which those states which characterize the second stage of Fever, may be formed. Let us suppose that, in either of those ways, these states have been produced. The high degree of Sensibility of the Nervous System, the high degree of action on the part of the Heart, the strong, but unavailing, resistance of the small Arteries, may, severally, last an uncertain time. The natural consequence of each of these states, will be, as we have just seen, the formation of an opposite state. The high degree of Sensibility will give place to Torpor; the powerful action of the Heart will subside into feeble contraction; the stubborn resistance of the small Arteries will give way. Accordingly we find, that, these natural consequences, are precisely the occurrences which are met with in the last stage of Fever. The Sensibility of the Nervous System becomes diminished in proportion to the duration and degree of its previous increase. The action of the Heart becomes feeble. Both these new states favour the increase of each other. The contraction of the small Arteries gives way; the struggle between these vessels and the Heart is at an end; so that the contraction of the Heart, although enfeebled, may still be able to carry on the circulation of the Blood, and, thus, an obstructed, or a stagnant, state of the round of the circulation, which would otherwise result from the languid action of the Heart, may be prevented.

It appears, then, that, both in the first, and in the last, stages of Fever, the Sensibility of the Nervous System, and the action of the Heart, are diminished; while, in the early stage, the contraction of the small Arteries is increased, whereas, in the decline of Fever, it is diminished, or altogether suspended. The different state of the contractile power of the small Arteries, then, appears to constitute the leading distinction between the character of these two stages of Fever.

From the result of our investigation, it appears, that the states which characterize the second stage of Fever, are the consequences of those states which usher in Fever; and that the states which constitute the third stage, are the natural results of those which are met with in the second stage. It follows, then, that the states attendant on the third stage, as well as those which mark the second stage, are the consequences of those states which appear in the first stage of Fever.

Those states which characterize the commencement of Fever, are, consequently, those which particularly demand our notice, since upon these, upon their degree, and upon their duration, depend the characters of the two succeeding stages.

We have seen, that the Torpor of the Nervous System, which attends the early stage of Fever, is succeeded, in the second stage, by Increased Sensibility, which, in the third stage, is followed by a return of Torpor. Increased Sensibility, then, both follows and precedes Torpor. As Increased Sensibility, then produces Torpor, so does it appear to be a consequence of Torpor.

It might, then, be expected, that, as Torpor in the first instance, leads to increased Sensibility, so might it, after it had succeeded to this latter state, again give place to a renewal of Increased Sensibility, which might again be replaced by Torpor. And this alternation of Torpor with Increased Sensibility, might be expected to continue, until the Nervous System had, gradually, fallen into a state, mid-way between these two extreme states.

Accordingly we find, that, although in some cases of Fever, the formation of the third stage closes the train of disordered states, yet, in other instances, there is a continued alternation of states; the states which characterize the second stage; succeeding to those which mark the third stage, and these last again occuring as a sequel to the repetition of the second stage.

The commencement and progress of Fever are not always characterized by the train of states which have been laid down in the foregoing analysis. In some instances, the Symptoms which usher in Fever, are such as denote the existence of Increased Sensibility of the Nervous System, which may arise from an Erethismal, or an Inflamed, condition of the Cerebral structures. The second stage of Fever will, in these cases, be constituted by states similar to those which ushered in the attack, the difference being, that, in the second stage, they exist in a greater degree, and to a greater extent. The first and second stages of Fever in these cases, then, differ in degree, not in essential character. The Increased Sensibility, in these cases, may proceed, from Erethism, to which Inflammation may succeed, or the Inflammatory state may exist from the commencement. The third stage, in these cases, may be characterized by states, similar to those which have been already pointed out as occurring in the decline of Fever. It is unnecessary that I should enter more at large into the analysis of the constitution of this variety of Fever; the object of the foregoing investigation being, the explanation of the phænomena of that class of Fevers, in which Diminished Sensibility, and diminished action of the Heart, are the precursors, of increased Sensibility of the Nervous System, and of increased action of the Heart.

It appears, then, that, although different cases of Fever may agree in their general character, yet they may have various shades of difference, owing to the varied order, in which the several states which characterize their successive stages, may arise.

The variety of character which is observable in different cases, may be, in a great measure dependent upon the means which are adopted by the Physician. If the increased Sensibility of the Nervous System, and the increased action of the Heart, which are present in the second stage, are the natural results of the diminished Sensibility, and of the diminished action of the Heart, in the previous stage, and if the Torpor and the feeble action of the Heart, in the third stage, are the natural results of the states which characterize the second stage; we may, by using means in the early stage, which are calculated to diminish, still more, the Sensibility of the Nervous System, and the action of the Heart, cause the states which characterize the second stage, to arise sooner, or to take place in a greater degree than they otherwise would. And if we endeavour to ward off the attendants of the third stage, by using means, during the second stage, which are calculated to increase the Sensibility of the Nervous System, and to promote the action of the Heart, we may hasten, or we may cause to arise in an increased degree, that Torpor and that feeble action of the Heart, which it was our object to prevent.

In managing Fever of this description, our business should be, so to treat it in its several stages, that we may guide it to a mild and favourable termination. By moderating gently the states characteristic of each stage, we may procure the supervention of mild degrees of those opposite states which mark the succeeding stage. Whereas it may happen, that, by using powerful means in either stage, we may cause a violent and protracted alternation of states, which may place the life of the patient in greater jeopardy, than it would have been in, had he been left to struggle through the attack without assistance.

APPENDIX.

No. 2.

REMARKS
ON
INFLAMMATION.

IN a paper which I presented last year to the Association of the College of Physicians in Ireland,* I described a state of the Cranial Brain, under the title ***Erethism***, and I expressed an opinion that such a state, existing in conjunction with a Plethoric state of the blood-vessels of that Brain, constitutes the condition which is called Inflammation of the Cranial Brain. I observed, that either of these constituents of Inflammation may exist separately; namely: that Plethora of the

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* See "Remarks on Affections of the Cranial Brain in Infants." Transactions of the Association of the College of Physicians, in Ireland. Vol. iii.

Cerebral blood-vessels, may be present without Erethism, and that Erethism of the Cranial Brain may exist without the presence of any marks which denote the co-existence of Plethora of the blood-vessels of that substance. I remarked further, that, when both these states have existed in conjunction, so as to constitute Inflammation, both may subside, in which case, the Inflammatory state will, of course, be at an end, or the Erethismal state may cease, leaving Plethora still existing in the Cerebral blood-vessels; or, the Plethora may be removed from these vessels, while the Erethism of the Brain continues, I stated also that Erethism of the Cranial Brain has a tendency to induce a Plethoric state of the Cerebral blood vessels, and *vice versâ.*

These remarks are applicable to the Spinal Brain also, and they may be extended to every part of the Body, in which nerves and blood-vessels exist,

The term Inflammation, when applied to the condition of any part of the Body, implies, that an irritated state of the Nerves of that part exists, in conjunction with a Plethoric state of the blood-vessels of that part, A Plethoric state of the blood-vessels may be present, without the co-existence of an irritative, or irritated, state of the Nerves which are mingled with those vessels; and such a state of Nerves may be present, without any perceptible increase of the quantity of Blood which is contained in the neighbouring blood-vessels.

If Inflammation, then, be a compound affection, including an altered state of a part of the Nervous System, as well as of a portion of the Vascular System, it follows, that it can exist so long only as such two altered states continue. For, whether the irritated state of the Nerves cease, or the Plethoric state of the blood-vessels be removed, the affection termed Inflammation must, in either case, cease to exist.

An irritated state of the Nerves of a part, may cause an increased quantity of Blood to flow through the blood-vessels of such part, aud *vice versâ.*

As each of the constituents of Inflammation has a tendency to cause the presence of the other; whether an irritative state of Nerves induce a Plethoric state of the blood vessels; or this latter state lead to an irritative state of Nerves; in either case, if both these states exist in the same part, at the same moment, Inflammation of that part will be constituted.

Inflammation, then, may be the final result of the operation of any cause, which, by its primary influence, induces, either an irritative state of Nerves, or a Plethoric state of blood-vessels.

When Inflammation has existed, in a part, if the Plethoric state of the blood-vessels of that part be removed, the Inflammation will be converted into Irritation; and if Inflammation being present, the irritative state of the Nerves be removed, the Inflammation will be converted into simple Plethora.

The irritative state of Nerves, which forms one of the constituents of Inflammation, may be confined to the Nerves of the Inflamed part; or it may exist in these Nerves, in common with other Nerves; in which latter case, it may be the effect of an Erethismal, or Inflamed, state of that Brain, with which the Cerebral extremities of the affected Nerves are principally connected.

The Plethoric state of blood-vessels, which is the other constituent of Inflammation, may be general, or it may exist in that part only which is the seat of the Inflammation.

If an increased quantity of Blood be contained in one set of blood-vessels only, such local Plethora must be the effect, either of increased resistance to the passage of Blood from those vessels, or of an increase, in the first instance, of the capacity of those vessels.

Thus, an Artery may contain an increased quantity of Blood, owing to an impediment existing to the passage of Blood from it, by any of its terminations, whether such impediment exist in its extreme branches, in Secreting vessels, in Veins, or in Exhalants. If such impediment exist, since a fresh supply of Blood is destined to flow into that Artery at each contraction of the Heart, that Artery must either receive such continued supply, in which case, it will soon become unusually distended, or it must offer a resistance, the strength of which is greater than that of the Momentum of the Blood. In the former case, the contractile power of the Artery will give way before the superior force with which the Blood is endowed; in the latter case, it will prevail against that force. There will, then, be a continued struggle between the Artery and the Momentum of the Blood, or, in other words, between the contractile power of the Artery, and that of the Heart. The only means, then, whereby a turgid state of such an Artery may be prevented, or removed, are: the removal of the impediment to the flow of Blood from its terminations; or an increased exertion of the contractile power of that Artery; or a diminution of the exertion of the contractile power of other Arteries: or a diminution of the action of the Heart; or a diminution of the general mass of the Blood.

The Plethoric state of an Artery, then, may be attended, in the first instance, by a strong resistance, on the part of the contractile power of that vessel, to the impelling force which distends it. But, when that resistance has been kept up for some time, the contractile power of the Artery may become so enfeebled, that it can no longer offer any opposition to the Momentum of the Blood; in which latter case, the Plethoric state will exist, without any struggle on the part of the Artery.

It may happen, that the contractile power of an Artery may be enfeebled in the first instance, in which case, an increased proportion of the general mass of the Blood will find its way into that vessel. In this case, the Plethora will, from its first formation, exist without any effort of resistance on the part of the Artery.

It has been stated in the preceding work, that an Artery possesses an Elastic structure, as well as that contractile structure, the exertion of which is expressed by the term Tonicity. In the large Arteries, the Elastic structure prevails in a great degree, while in the minute extremities of Arteries, it is nearly, if not entirely, wanting. In the former Arteries, the Tonicity is feeble, while in the latter, it exists in a great degree. In an Artery which possesses an Elastic structure, the pervious state of the vessel is preserved, not only by the Momentum of the Blood, but also by the Elasticity of that structure; these united forces overcoming the Tonicity, which, if unopposed, would convert the Artery into an impervious cord. The Momentum of the Blood is, then, assisted by the Elasticity of the Artery. But, if an attempt be made to distend that vessel beyond the extent to which its own Elasticity (if unopposed by the Tonic power) would carry it, such attempt will be opposed by the Elastic structure. So that, should the exertion of the Tonic power be enfeebled, or suspended, in such Arteries, its Elastic structure would still be opposed to the Momentum of the Blood. But, in the minute Arterial branches, in which the Elastic structure is altogether wanting, the only opposition which is made to the Momentum of the Blood, is offered by their Tonicity; so that, if the exertion of their Tonic power be enfeebled, or be overcome, no farther resistance will be offered to the Blood, excepting that which results from the inelastic texture of their coats, so that their coats may yield more and more to the current of the Blood, until rupture of them take place.

It appears, then, from the preceding statements, that Inflammation may exist under different circumstances; viz:

There may be local Plethora conjoined to local irritation of Nerves.

There may be local Plethora, together with an irritated state of the Nervous System generally.

There may be general Plethora, with local irritation of Nerves.

There may be general Plethora, with an irritated state of the Nervous System generally.

The Plethora may be attended, in the first instance, by strong resistance on the part of the Arteries, which resistance may, gradually, be diminished, or may cease. Or the Plethora may, from its first formation, be unattended by any resistance on the part of the Tonic power of the Arteries.

The Plethora may take place in Arteries which possess an Elastic, as well as a contractile (or Tonic), structure; or it may occur in those minute branches in which the Elastic structure is wanting.

We have just stated, that Inflammation may be attended with an increase of the general mass of the Blood; the quantity of that fluid may also be less than the usual standard; or the usual quantity of Blood may be present.

The Arteries of the Inflamed part may transmit the increased quantity of Blood which they receive; or they may transmit a portion of it; or the flow of Blood from them may be entirely impeded, in which latter case, their contents will be in a stagnant state, to which the term Congestion has been applied.

From the foregoing statements it appears, that Inflammatory states may be reduced to the following heads:

I. General Inflammation.	General Irritation of the Nervous System. General Plethora.

II. Local Inflammation.	1.	Local Plethora. General Irritation of the Nervous System.
	2.	Local Plethora. Local Irritation of the Nervous System.
	3.	General Plethora. Local Irritation of the Nervous System.

Local Inflammation may be further divided into:

Inflammation, with active resistance of the Tonic Power of Arteries.

Inflammation, with enfeebled, or suspended, action of the Tonic Power.

Inflammation, in a part whose Arteries possess both Elasticity and Tonicity.

Inflammation, in a part whose Arteries do not possess an Elastic structure.

When any part is the seat of Inflammation, there is increased redness of that part; the temperature of the part, and the quantity of Heat evolved from it, are increased; there is increased tenderness of the part, and painful Sensations are referred to it.

The increased redness is a consequence of the presence of an increased quantity of Blood in the blood-vessels of the part; it is, therefore, a Symptom depending upon one of the constituents of Inflammation, namely, upon Plethora.

The increased warmth of the part depends, partly, upon the presence of an increased quantity of Blood. But, as the formation and extrication of Heat, are processes, which are, principally, dependent upon the Nervous System, and which are, consequently, influenced by altered conditions of that system, the increased warmth, and the increased evolution of Heat, which accompany Inflammation, may be chiefly attributed to the irritated state of the Nerves. Besides, the evolution of an increased quantity of Heat, takes place in Fever, and in other cases, in which Inflammation is altogether wanting.

The increased tenderness is a consequence of the increased Sensibility of the Nerves.

Pain, like all other Sensations, is dependent upon a certain state of a portion of the Nervous System. It may arise in two ways. First, it may be produced by an increased degree of ordinary impressions, or by unusual impressions. Secondly, it may arise from increased Sensibility of Nerves, during the existence of which, pain may arise from impressions, which, in a natural state of those Nerves, do not give rise to any Sensation. For the degree of Sensation which is present in any case, depends, not only upon the nature and the degree of the impression, but upon the state of the Nerve impressed. If the Sensibility of Nerves be increased, unusual Sensations will be present, even when Nerves are subjected only to those ordinary impressions, which, usually, do not give rise to any Sensation, or which do not produce any Sensation of a painful nature. Thus, if the Sensibility of the Eye be increased, pain will result from the presence of ordinary degrees of Light. When Nerves are highly Sensible, the pulsation of Arteries is felt, although the usual quantity of Blood circulates with the usual Momentum, and with the usual degree of resistance only, on the part of the Arteries. In a highly Sensible state of the Nerves of the Alimentary canal, the passage of food, which usually does does not give rise to Sensation, may cause severe pain.

When, added to increased Sensibility of Nerves, there is a Plethoric state of blood-vessels, the Nerves which are intermingled with those vessels will be subjected to an increased degree of mechanical pressure, and Pain will be produced; and this Sensation will continue, until the Sensibility of Nerves is diminished, or lost, or until the Plethora is removed.

Pain then, although an attendant on Inflammation, may be present, in many instances, when Inflammation is wanting.

The presence of Inflammation, then, is not exclusively denoted by an Irritable state of Nerves, nor by Plethora, nor by Pain; for Pain may be connected with Increased Sensibility, yet Inflammation may be absent; and Plethora may be attended with Pain, although Inflammation be not present. It is the co-existence of these characters which denotes the presence of Inflammation.

The effects of Inflammation depend much upon the nature of the part which it occupies. In Inflammation of a part in which Secretion is carried on, the altered state of the Nerves may induce an altered, and an increased, performance of the process of Secretion, while the Plethoric state of the blood-vessels will furnish an increased supply from which the secreted fluid may be derived. Thus a two-fold cause of increased Secretion will be present. When, for instance, Inflammation is seated in a Mucous surface, (*i. e.* on a surface possessing vessels which secrete and pour out Mucus) an increased quantity of Mucous fluid will be poured out. This increased Secretion does not proceed from the altered state of the Nerves only, nor from the Plethoric state of the blood-vessels, but from both these causes united. For, if an irritated state of the Nerves of the Mucous surface were present alone, an increased quantity of Mucus would be secreted; and simple Plethora might lead to increased secretion of that fluid.

When a surface upon which Exhalants open, (or, in other words, a serous Surface) is the seat of Inflammation, that state is, in many instances, followed by increased flow from those vessels. The irritated state of the Nerves alone, would dispose the Exhalants to give passage to an increased quantity of fluid; and the same effect might result from simple Plethora.

There are other fluids which are the products of vessels which are situated in an inflamed part. As the blood furnishes the materials for all such fluids, so will the Plethoric state of the blood-vessels during Inflammation, furnish an increased quantity of those materials, while the separation of them from the Blood is influenced, or produced, by the state of the Nerves.

As Inflammation, then, is compounded of Plethora, and of an irritated, state of Nerves, so may its several symptoms, and its several effects, be traced to one, or to both, of these constituent states.

It follows, from what has been stated, that the removal of Inflammation may be effected, either by a removal of the irritative state of Nerves, or by a removal of the Plethoric state of blood-vessels.

APPENDIX.

No. 3.

APHORISMS

RESPECTING

ABSORPTION.

I

THE Absorbents are vessels, which, at one extremity, terminate by open mouths, while at the other extremity, they form unions with each other, so as to constitute common trunks which open into Veins near the Heart. The former of these terminations may be called the oral extremity, the latter, the Venous extremity, of an Absorbent.

II.

The structure of Absorbents is very delicate.

III.

The Absorbents are furnished with Valves, which open in a direction from their oral, to their Venous, extremities.

IV.

An Absorbent is often, between its two extremities (I), lost in a substance termed a Gland, into, and out of, which, it may be traced.

V.

Liquid matter which enters at the oral extremity of an Absorbent, flows onward in a direction towards the Venous extremity, until it gets into the Vein (I), in which it is mixed with a portion of the circulating Blood.

VI.

Any attempt to force the contents of an Absorbent in a direction from the Venous to the oral extremity, will be opposed by the Valves (III), already mentioned.

VII.

Mechanical pressure applied to an Absorbent, will, then (VI), tend to force the contained fluid onward in a direction towards the Venous extremity.

VIII.

If the fluid contained in the common trunks of Absorbents is made to advance towards the Venous extremities, fluid will advance in a direction from the oral extremities to take its place.

IX.

The advance of the contents of an Absorbent, from any point of that vessel, towards the Venous extremity, will, then (VIII), cause an advance of fluid from the oral extremity towards that point.

X.

Mere capillary attraction will be sufficient to cause liquid matter, which is presented to the oral extremities of Absorbents, to enter those extremities.

XI.

Whenever, then, from any cause, the fluid which has entered the oral extremity of an Absorbent, has passed onward in a direction towards the Venous extremity, a fresh quantity of fluid will be received into the oral extremity (X), provided that liquid matter be presented to this extremity.

XII.

The advance of the contents of an Absorbent along any part of that vessel, will, then (VIII, IX, X, XI), cause an increased quantity of liquid matter to enter its oral extremity.

XIII.

The quantity of fluid, then, which enters the oral extremity of an Absorbent, is, in part, regulated (XII), by the degree of velocity with which the contents of the common trunks advance.

XIV.

Supposing the advance of the contents of the common trunks to continue at the same rate, it follows (VIII, XIII), that, if one set of oral extremities receive a smaller quantity of fresh fluid, other oral extremities will receive a greater quantity of fresh fluid, (provided that a sufficient supply of liquid matter be presented to those extremities), and *vice versâ.*

XV.

It appears, then (XIV), that we have it in our power to cause an increased quantity of liquid matter to enter the oral extremities of one particular set of Absorbents, simply by with-holding a supply of fluid from the oral extremities of the other Absorbents.

XVI.

Absorbents are continually subjected to various degrees of mechanical pressure. In their course along the extremities of the Body, they are compressed during the contractions of Muscles, and by distension of the blood-vessels with Blood. Within the cavities of the Abdomen and Thorax, they are compressed by the movements of the Diaphragm, by the distension of the Alimentary canal, by the distension of the air-cavities of the Lungs, by distension of the blood-vessels, and by the actions of Muscles situated externally to the Thorax and the Abdomen. Absorbents are also, of course, subjected to the pressure of the Atmosphere, as well as to pressure produced by clothing.

XVII.

The effects of this pressure to which Absorbents are continually subjected (XVI), must be: the advancement of their contents towards their Venous extremities (VII), and the reception of a fresh quantity of fluid matter (XII), into their oral extremities.

XVIII.

We cannot demonstrate the existence of any powers by which fluids are made to enter, and to pass through, Absorbents, excepting those already mentioned (X, XV, XVI).

XIX.

It is, indeed, supposed, that Absorbents possess a structure which is capable of assuming a contracted state, and that the contractions of this structure take place in such a manner, as to propel the contents of these vessels in a direction from the oral, to the Venous, extremities.

XX.

The mass of circulating Blood is perpetually suffering a diminution of its quantity, by the separation of fluid in Secreting vessels, and by Exhalants, as well as by a separation of a portion of it by those vessels which have been termed Nutritive vessels.

XXI.

The Blood, then (XX), is the common general stock, from which all Secreted and Exhaled fluids, and all additions which are made to the solid structures of the Body, are derived.

XXII.

The Matter, then (XXI), of which the solid structures of the Body are composed, was, originally, in a fluid state, or was suspended in a fluid.

XXIII.

The Matter, of which the solid structures of the Body are composed, is not permanent; for older Matter is continually removed, while fresh Matter is deposited (XX, XXII), to take its place.

XXIV.

The older Matter, thus detached (XXIII) after having formed a portion of the solid structures of the Body, is removed, either by attrition, or by direct separation from the Body, or is taken up and carried into the Blood, by Absorbents.

XXV.

Absorbents are neither endowed with a structure (II, IV), nor with a faculty (XVIII, XIX), which can enable them to detach, and to carry into the Blood, solid portions of the Body. It follows, then, that before the Matter composing such portions can be received into the oral extremities of Absorbents (XXIV), it must be again brought into that liquid state in which it was (XXII) when it was first deposited.

XXVI.

As the Blood is continually suffering a diminution of its quantity (XX), so is it continually receiving an addition to its mass from the Absorbents (V).

XXVII.

The liquid matter (V) which is contained in Absorbents, consists of fresh matter which is, for the first time, entering the Vascular System; of fluids which have been separated from the Blood (XX); and of matter which has formed a portion of the solid structure of the Body (XXIII, XXIV, XXV).

XXVIII.

The Blood, then, receives again (XXVII) a portion of the Matter which has been separated from it (XX, XXIV, XXVII.).

XXIX.

It appears, then (XX), that, were no supply furnished to the Blood, the quantity of the Blood would be continually more and more reduced. It also appears (V, XXIV, XXVI, XXVII), that were no portion detached from the Blood, the quantity of that fluid would be continually augmented, supposing that fresh matter were continually admitted into the Absorbents.

XXX.

The quantity of the general mass of Blood, then (XXIX), depends upon the quantity of fluid which is separated from it (XX), and upon the quantity which is poured into it by Absorbents (XXVI, XXVII).

XXXI.

The quantity of fluid which flows into the Blood from Absorbents (XXVI), depends upon the degree of velocity with which the contents of Absorbents are propelled, as well as upon the quantity of liquid matter which is presented to the oral extremities of those vessels (VIII, IX, X, XI, XII, XIII).

XXXII.

The degree of velocity with which the contents of Absorbents are propelled, in a direction from their oral to their Venous extremities, depends upon the degree of mechanical pressure to which those vessels are subjected (VII, XVI), and, possibly, upon some action of the Absorbents themselves (XIX).

XXXIII.

The quantity of liquid matter which is presented to the oral extremities of Absorbents, depends upon the quantity of Secreted and Exhaled fluids present (XXVII); upon the quantity of fresh liquid supply that is furnished (XXVII); and upon the quantity of solid portions of the Body which have been again reduced into a liquid state (XXII, XXIII, XXV, XXVII).

XXXIV.

The quantity of Secreted and Exhaled fluids which is presented to the oral extremities of Absorbents (XXVII, XXXIII), depends not only upon the extent to which the processes of Secretion and Exhalation are carried, but also upon the more or less speedy removal of those fluids from the surfaces and cavities of the Body, after they have been separated from the common mass of the Blood (XXI).

XXXV.

The fresh supply (XXVII), which is presented to the oral extremities of Absorbents, is either conveyed into the Alimentary canal, or into other passages and cavities having external outlets; or is applied to the external surface of the Body.

XXXVI.

The conversion of portions of the solid structure of the Body into liquid matter (XXII, XXIII, XXV, XXVII), may arise, from the action of fluids which have been separated from the Blood (XXI), upon such portions; or from means applied from without.

XXXVII.

The solution of portions of the solid structure of the Body, when accomplished by the action of fluids which have been separated from the Blood (XXXVI), may arise, either from the less perfect solidity of such portions; or from some altered state of attraction between the particles of which such portions are composed; or from some altered state of those fluids.

XXXVIII.

The less perfect solidity (XXXVII), of such portions, may arise from an altered state of the materials of which they are composed.

XXXIX.

Such an altered state (XXXVIII), of the materials composing such portions of the solid structures of the Body, may arise, from a deficiency of some of the component parts of those materials, in the common mass of the Blood (XXI); or from an imperfect performance of the process of assimilation in the Nutritive vessels (XX).

XL.

A deficiency (XXXIX), of some of the materials whereof the more solid structures of the Body are composed, existing in the general mass of the Blood (XXI), may arise from a want of the component parts of such materials in the fresh supply (XXXV), which is presented to the oral extremities of Absorbents, or from a diminution of the quantity of fluid conveyed into the Blood by Absorbents (V, XXVI).

XLI.

The imperfect performance of the process of assimilation (XXXIX), if it do not proceed from any of the causes already mentioned (XXXIX, XL), may arise from some faulty state of the Nutritive vessels themselves (XX, XXXIX).

XLII.

An altered state of attraction (XXXVII) between the particles of which the solid structures of the Body are composed, may arise, from undue proportions of the different kinds of those particles; or from a diminution or destruction of the power called Life, which is resident in those structures.

XLIII.

The combination of the different particles which enter into the composition of solid structures, in undue proportions, may proceed from some of the causes already mentioned (XXXVIII, XXXIX, XL, XLI).

XLIV.

Life being the power which prevents the constituent particles of the Body from yielding to the laws of *Chemical affinity*, it follows, that, if that power be diminished, or destroyed, (XLII), in any part, the particles which enter into the composition of that part will yield, more readily, or entirely, to those laws.

XLV.

If the particles which compose any of the solid structures of the Body, are thus (XLIV) left at liberty to obey Chemical laws, a portion, or the whole, of them may unite in such a manner as to form a liquid.

XLVI.

If any portion of the solid structures of the Body loses its Life (XLIV), it will be more readily acted upon by fluids (XXXVI) which have been separated from the Blood, as well as by means from without.

XLVII.

So that the destruction of the Life of any of the solid structures of the Body (XLIV), may, in different ways, lead to the conversion of that structure into a liquid (XLV, XLVI).

XLVIII.

The state of the fluids which are separated from the Blood (XXXVI, XXXVII), is dependent upon the quantity, as well as upon the quality, of the Blood; upon the state of the vessels (XX) in and by which they are separated; and upon the influence which is exerted upon the contents of those vessels, by, and through, the Nerves which are in their immediate neighbourhood.

XLIX.

A portion of the solid structure of the Body may lose its Life, in consequence of a cessation of the circulation of Blood through its blood-vessels, whether produced by compression, or ligature, applied to the principal trunks of those vessels, or arising from Plethora, or from obliteration, or from some other diseased state, of the vessels themselves. A portion of the solid structure may also have its Life destroyed, by the continued application of powerful Stimulants (or by the application of mild Stimulants if it possess but a faint degree of Life,) or by the application of substances which act Chemically upon such portion, or by the sudden and copious abstraction of Heat.

L.

The degree of Life contained in a part of the solid structures of the Body, may be rendered feeble, by milder degrees of those same means (XLIX) which cause its entire destruction, and also by an interruption of the communication of the Nerves of such part with the rest of the Nervous System, as well as by lessening the Sensibility of the Nerves of such part.

LI.

The means applied from without (XXXVI), may produce the conversion of solid parts of the Body into a fluid, by disturbing the mutual attraction (XXXVII) which exists between the particles composing such parts; or by altering the state of the fluids which are separated from the Blood (XXXVI, XXXVII), either by their direct action upon those fluids, or upon the vessels(XX, XLI), in and by which those fluids are separated, or upon the Blood from which those fluids (XXXVI) are separated(XXI), or upon the Nerves (XLVIII) which are in the immediate neighbourhood of the vessels just mentioned. Or means applied from without may procure the solution of solid parts of the Body (XXXVI) by diminishing(L), or destroying (XLIX), the Life of such parts (XLII, XLIV, XLV, XLVI, XLVII).

LII.

We have seen, that the separation of fluids from the Blood (XX, XXI, XXIII), and the formation of solid structures (XXI, XXII,) XXIII), is continually carried on; and that the removal of a portion of those fluids (XXVII), and of a portion of those solid structures(XXIII, XXIV, XXV, XXVII), is also continually taking place, through the medium of Absorbents, which convey such portions into the Blood (XXVI, XXVIII).

LIII.

It is evident, then (LII), that the presence of an increased quantity of fluids which have been separated from the Blood, may arise, either from an increased separation, or from diminished Absorption, of them.

LIV.

It is also evident (LII, LIII), that the presence of a diminished quantity of the fluids which are separated from the Blood, may be alike the consequence of diminished separation, or of increased Absorption, of them.

LV.

Thus, it follows (LII, LIII, LIV), that an increasing growth of the solid structures of the Body (XXI, XXII), may arise, either from an increased separation and assimilation of materials (XX, XXI), by the Nutritive vessels; or from a diminution of the process of liquefaction (XXV, XXXVI), and a consequent diminished removal, (XXV, XXVII, XXXI,) by Absorbents, of the materials composing such structures.

LVI.

It follows also (LV,) that a diminution of the solid structures of the Body, may arise, either from diminished separation and imperfect assimilation of materials in the Nutritive vessels; or from an increase of the process of liquefaction, (and a consequent increased removal by Absorbents), of the materials composing such structures.

LVII.

Solid substances which do not form a part of the Body, but which are attached to, or contained in, some part of it, are, in some instances, removed, and are carried into the Blood, through the medium of Absorbents.

LVIII.

It follows from what has been already stated (XXV), that a reduction of such substances (LVII), into a liquid state, is requisite, in order that the materials, whereof they consist, be admitted into Absorbents.

LIX.

The reduction of such substances (LVII), into a liquid state (LVIII), may be effected, either by the action of fluids which have been separated from the Blood, or by means applied from without, (XXXVI).

LX.

The reduction of such substances (LVII), into a liquid state, by the action of fluids which have been separated from the Blood (LIX), may be produced, when those fluids are in their natural state, or only under an altered state of those fluids.

LXI.

The circumstances upon which the state of these fluids (LX) is dependent, have been already mentioned (XLVIII).

LXII.

Thus it appears (XXV, XXVII, XXXVI, LVI, LVII, LVIII, LIX), that Absorbents perform no part in the conversion of solids into fluids. They therefore have nothing to do with the performance of the preliminary process which is requisite for the removal of solid structures; they merely receive into their oral extremities, the materials of these structures, when, by any means, they have been made to assume a fluid state.

LXIII.

It appears, then, from the preceding statements and inferences, that, if the removal of any fluid which has been separated from the Blood, is expedited, or effected, by any artificial means, such means must act, (unless they procure the direct removal of that fluid from the Body,) either by lessening the farther separation of such fluid from the Blood, or by increasing the absorption of it after it has been separated from the Blood (LIV).

LXIV.

It appears also, that, if the removal of any portion of the solid structure of the Body, is expedited, or effected, by any artificial means, such means must act, either by procuring the direct separation of such portion from the rest of the Body (XXIV); or by lessening the continued addition to such portion (XXXII); or by procuring the liquefaction of it, so as to enable it to pass from the Body, or to enter the oral extremities of Absorbents (LVI, LXII).

LXV.

The application of Stimulants, is, in many instances, followed by a diminution of the volume of fluids (XX) which have been separated from the Blood.

LXVI.

Stimulants have a tendency to increase the separation of fluids from the Blood (XX). If the application of Stimulants, then, be succeeded by a decrease of the volume of such fluids (LXV), such an effect must arise from their causing an increase of those fluids to enter the oral extremities of Absorbents (LXIII).

LXVII.

We have no grounds for supposing that the application of Stimulants (LXV) can cause an increased exertion of the power of Capillary attraction (X), nor can such application cause an increased degree of mechanical pressure (XVI, XVII), to be exerted upon Absorbents.

LXVIII.

The only powers, then, which we can demonstrate as causing liquid Matter, to enter into, and to be conveyed through, Absorbents (XVIII), appear not to be affected (LXVIII) by the application of Stimulants.

LXIX.

If Absorbents possess a structure (XIX), which admits of various degrees of contraction, we may readily conceive that the application of Stimulants (LXV), may cause that contraction to take place in an increased degree, and by so doing, they may cause the contents of Absorbents to be more forcibly propelled towards the Venous extremities of those vessels (VII, XIX).

LXX.

It seems probable, then (LXV, LXVI, LXVII, LXVIII), that Absorbents possess that contractile structure which they have been supposed to have (XIX), and that the application of Stimulants causes increased contraction of that structure (LXIX).

LXXI.

Friction is also found, in many instances, to be followed by a decrease of the volume of fluids (XX), which have been separated from the Blood.

LXXII.

Friction may act as a Stimulant, and also as a means of producing mechanical pressure.

LXXIII.

Friction, then (LXXII), may, in two different ways (VII, VIII, XII, LXV, LXX), produce a decrease of the volume of fluids which have been separated from the Blood.

LXXIV.

Pressure, long-continued, is, in many instances, attended with a decrease of the volume of fluids (XX) which have been separated from the Blood, in the part to which it is applied.

LXXV.

Pressure may induce such decrease (LXXIV), either by lessening the farther separation of such fluids from the Blood, or by increasing the Absorption of them (LXIII).

LXXVI.

As Stimulants tend to increase (LXVI) the separation of fluids from the Blood, so do those means, which diminish the Sensibility of the Nervous System, locally, or generally, tend to lessen such separation.

LXXVII.

Pressure, long-continued, diminishes the Sensibility of the Nerves of the part to which it is applied; it therefore (LXXVI) tends to lessen, in that part, the separation of fluids from the Blood.

LXXVIII.

Pressure upon Absorbents, tends, as we have seen (VII, VIII, XII) to cause an increased quantity of fluid to be received into, and to pass through, Absorbents.

LXXIX.

Pressure, then (LXXVII, LXXVIII), may, in two different ways (LXXV), produce a decrease of the volume of fluids which have been separated from the Blood (LXXIV).

LXXX.

The application of Stimulants, is, in many instances, followed by a diminution in volume, of portions of the solid structure of the Body.

LXXXI.

As Stimulants have a tendency (LXVI), to increase the separation of fluids from the Blood, their effect in procuring a removal of portions of the solid structure of the Body (LXXX), may, in some cases, depend (XXI) upon their producing increased Absorption (LXIX, LXX) of the fluids which are destined to form an addition to those structures (XXII, LXIV).

LXXXII.

In other cases, Stimulants may procure the removal of portions of the solid structures of the Body (LXXX), by inducing an increased separation (LXVI) of fluids from the Blood, or an altered state of those fluids, from which may result a conversion of such portions into a fluid state (XXXVI, XLVIII, LI), in consequence of which conversion, they become admitted into Absorbents (XXV, LXIV).

LXXXIII.

In other cases, the application of Stimulants may procure the removal of portions of the solid structures (LXXX), by destroying (XLIX), or diminishing (L), the Life of such portion, and thus causing the conversion of the materials composing such portion, into a liquid state (XLII, XLIV, XLV, XLVI), in consequence of which such materials gain admittance into, and are conveyed away by, Absorbents.

LXXXIV.

The application of Stimulants, then, may procure the removal of a portion of the solid structures of the Body, by producing various direct effects (LXXXI, LXXXII, LXXXIII).

LXXXV.

Friction is also followed, in some cases, by a diminution of the bulk of portions of the solid structures of the Body.

LXXXVI.

As Friction acts as a Stimulant, while it also produces mechanical pressure (LXXII), it may procure the removal of portions of the solid structures (LXXXV), in the various modes that Stimulants produce the same effect (LXXXI, LXXXII, LXXXIII), and also by causing an increased quantity of the constituent materials of such portions, when reduced into a liquid state (XXV), to enter the oral extremities of Absorbents (VII, VIII, XII).

LXXXVII.

Pressure, long-continued, is, in many cases, attended by a decrease of the bulk of portions of the solid structure of the Body.

LXXXVIII.

Pressure must produce such decrease (LXXXVII), either by lessening the continued addition to such portions (XXXII), or by procuring the conversion of it into a liquid (LXIV).

LXXXIX.

It appears (LXXV, LXXVII, LXXVIII, LXXIX), that Pressure may produce a diminution of the addition which is continually made to the solid structures (XXII, LXXVIII).

XC.

As Pressure tends to cause increased Absorption of fluids (LXXVIII), so, when any of the materials composing portions of the solid structures of the Body, have been, by any means, made to assume a liquid form (XXV), it may cause such liquid to be more readily Absorbed.

XCI.

Pressure, if long-continued, or if great in degree, may produce a destruction (XLIX), or a diminution (L), of the Life of portions of the solid structures, and, by so doing, it may lead to the conversion of such portion into a liquid state (XLII, XLIV, XLV, XLVI).

XCII.

Pressure, then, may, by producing various direct effects (LXXXVIII, LXXXIX, XC, XCI), procure a diminution of the bulk of portions of the solid structures of the Body (LXXXVII).

XCIII.

A removal of the Cuticle, is, in many cases, succeeded by a diminution of substance in the subjacent solid structures.

XCIV

When the cuticle is removed from any part, common impressions, which, when made upon that part in its sound state, scarcely produced any effect, will, if repeated upon it during its denuded state, act as Stimulants.

XCV.

We may explain, then, from what has been already stated (LXXXIV), why a removal of the Cuticle may induce a loss of substance in the subjacent parts (XCIII, XCIV).

XCVI.

It appears, that the only mode by which we can cause Absorbents generally to take up and convey an increased quantity of liquid matter, consists in increasing the velocity with which the contents of those vessels are propelled (XII, XIII, XVII, XVIII).

XCVII.

We can increase such velocity (XCVI) only, by causing an increased degree of pressure to be exerted upon the contents of these vessels (XVI, XVII, XVIII, LXVII, LXVIII, LXIX, LXX, LXXIII, LXXV).

XCVIII.

Such an increased degree of pressure (XCVII) can be produced, only, either by increasing the mechanical pressure externally to the Absorbents (XVI, LXXII, LXXIX), or by increasing the exertion of that contractile power (XIX, LXX), which Absorbents are supposed to possess (LXIX, LXXIII).

XCIX.

We may cause an increase of mechanical pressure externally to the Absorbents (XCVIII), by increasing Muscular action generally (XVI); by promoting free and active respiration (XVI); by exciting the acts of Retching and Coughing (XVI); and by pressure applied externally to the Body.

C.

If we admit that Absorbents possess a contractile power (XIX, LXX), we may, probably, cause an increased exertion of that power (XCVIII), by the application of Stimulants to those vessels (LXV, LXIX, LXXI, LXXII).

CI.

It appears probable (XIV, XV), if we wish to produce increased Absorption by any particular set of Absorbents, that we may promote that end, not only by adopting the modes already mentioned (XCVII, XCVIII, XCIX, C, CI), but also by causing a lessened quantity of liquid Matter to pass into other Absorbents.

CII.

If, for instance (C), we wish to cause an increased Absorption of fresh Supply (XXXV), we may, in addition to other modes of increasing Absorption, cause a smaller quantity of the other fluids (XXXIII) to be presented to the oral extremities of Absorbents, either by causing a smaller quantity of fluids to be separated from the Blood (XXXIV), as well as by preventing the solution of portions of the solid structures (XXXIII, XXXVI), or by promoting the speedy removal of such liquid matter from the Body.

CIII.

If, on the other hand, we wish to cause increased Absorption of fluids which have been separated from the Blood, or of portions of the solid structure which have been reduced into a liquid state, (XXXIII), we may promote this object, by with-holding fresh supply (XXXV), as by using slender, solid, diet, and by keeping the Body in a dry atmosphere, while we at the same time employ the other means already mentioned.

CIV.

If we wish to obtain the direct removal of any solid structure by Absorbents (XXIII, XXIV, LVII), we can only do so (XXV, XXXIII) LVIII), after we have first procured the conversion of such structure into a liquid (CIV, CV, CVII, CVII, CIX, CVI).

CV.

The process of Absorption may be diminished generally, owing to a deficiency of liquid matter, (XXXIII); or to an obstructed state of the absorbing vessels, at any point between their oral and their venous, extremities (I); or to a diminished exertion of the contractile power (XIX, LXX), of Absorbents; or to a diminution of the mechanical pressure to which Absorbents are subjected (XVI).

CVI.

An obstructed state of Absorbents (CIV), may arise, from mechanical pressure, so applied as to render their tubes impervious; from a thickened, or tortuous, or inflamed, state of these vessels; or from diseased states of the Glands (IV), through which they pass.

CVII.

As Absorbents appear to be endowed with a contractile power (XIX, LXX), which is exerted in an increased degree in consequence of the application of Stimulants (LXX), so do those means which diminish the Sensibility of Nerves, appear to diminish Absorption, by causing that contractile power to be exerted in a less degree.

CVIII.

Thus, the abstraction of Heat, the application of Sedatives, and the compression, or division, of Nervous trunks, appear to lessen Absorption, by diminishing the exertion of the contractile power (XIX, LXX), which is supposed to reside in Absorbents.

CIX.

A diminution of the mechanical pressure to which Absorbents are subjected (CIV), may be the result of a diminution of Muscular action generally, or of looser clothing, or it may arise from a diminution of any of the other causes (XVI), from which such pressure usually arises.

CX.

The process of Absorption by one particular set of Absorbents, may be diminished, from any of the preceding causes (CIV, CV, CVI, CVII, CVIII) or in consequence of an increased quantity of liquid Matter being furnished to the common trunks, from the oral extremities of other sets of Absorbents (XIV, XV, C).

CXI.

It may happen also, that a diminished quantity of liquid Matter may enter the oral extremities of Absorbents, owing to the interposition of some adventitious substance between such Matter and those extremities. Thus, a stratum of coagulable lymph, or of thickened mucus, interposed between those extremities and liquid Matter, may prevent the entrance of the latter into the former.

In the preceding statements and inferences, I have not entered into the question, whether any of the Veins do, or do not, absorb. If they do not, they are foreign to the subject of the investigation; if they do, they are, in fact, Absorbing vessels, and the foregoing observations are applicable to them also.

Hodson, Printer, Ludlow.

The Reader is requested to make the following corrections and additions.

Page 33 line 9 after *Exhalation* put a semi-colon.
— — 20 for a comma put a period.
— — 21 dele the article *a*
36 — 16 for *Abcesses* read *Abscesses*.
37 — 2 dele the note of interrogation.
43 — 7 for *surprize* read *surprise.*
44 — 1 for *Vins* read *Veins.*
63 — 9 after *later* put a comma.
67 — 13 for *on the* read *or the.*
80 — 21 after *comatose* add *state.*
84 — 22 after *at* put a comma.
108 — 10 dele comma after *other.*
125 — 1 for *Erostosis* read *Exostosis.*

APPENDIX.

134 — 5 for *State* read *States.*
179 — 1 for *resistence* read *resistance.*
200 — last line dele comma after *irritated.*